

# AVIATION WEEK

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## NEWS DIGEST



### Supersonic Reconnaissance

The prototype RF-108A Voodoo (photo-reconnaissance plane shown) is undergoing high-altitude tests at Langley Field, Va. Known. The elongated nose of the RF-108A, which weighs slightly less than the Voodoo fighter but has the same speed, is equipped with an electrically heated optical scanner that prevents fogging and freezing at high altitudes. Pilot operates camera system with cockpit controls.

### Domestic

Navy's Petrel anti-submarine guided missile is leaving operational use, according to Admiral Arthur Barker, Chief of Naval Operations. The Petrel is built by the guided missile division of Fairchild Eastern & Atlantic Corp. and is launched from patrol-type planes such as the Martin P-3M, Lockheed P-3V and Grumman S-2F. It is powered by a Fairchild J44 turbojet.

Guyton A. Tucker last week was appointed Deputy Assistant Secretary of Defense for Applications Engineering. He was moved from a position as Director of Ordnance and Transport Equipment at the same office and title is retained. He is William H. Martin, now Director of Research and Development in the office of the Secretary of the Army.

Subcontract orders totaling \$5,504,510 for engineering and production work on the new McDonnell F-101 Navy fighter (AW Sept. 5, p. 9) and the USAF F-101 Voodoo have been placed with Northrup American, Inc., Hawthorne, Calif. McDonnell and work on the F-101 will cost \$3,000,510. The other contract is for \$2,497,000 for work on three variants of the F-101—the F-101A fighter-bomber, RF-101A photo-reconnaissance version and the F-101B long range interceptor.

Northwest Orient Airlines' President Donald W. Nyrop reported plans to

order between eight and 10 jet transports sometime after the first of the year for the line's transcontinental and international routes.

North American Aviation's Columbus, Ohio, division began delivery of F-108C Super Sabres to the USAF as a second source of production for the supersonic fighter. The first Columbus F-108C was accepted by the Air Force 56 weeks after North American announced that the fighter would be produced there.

A "flying submarine" patent has been allowed by the Air Research and Development Corp. of Washington, D.C. The company admitted that the craft is "only in the thinking stage of development," but said the patent was awarded "several years" ago but kept secret for security reasons.

National Airlines ordered a strike by its pilots who demanded a change in the operation of the National Pan-American World Airways route through to South America. In the settlement, the strike and the Air Line Pilots Assn. agreed that National pilots would be paid for time flown over National's route by Pan-Am pilots in the event the interchange flight should occur.

All 41 persons aboard a United States DC-6B were killed last Tuesday night when the Portin-based transport apparently exploded in mid-air eight miles east of Longport, Colo.

The Fye Corp. said that wind-tunnel tests indicate its Fye short-haul transport (AW Sept. 26, p. 104) will be 10 to 15 mph faster than the originally announced top speed of 370 mph.

### Financial

North Central Airlines, which reported a net loss of \$312 during the first nine months of 1959, announced \$112,570 profit as of Sept. 30 of this year. Through September, the airline had earned 320,658 passengers, surpassing the 1974 total by 37,000.

Fairchild Camera and Instrument Corp. declared its largest cash dividend (75 cents per share) in more than 20 years. The new dividend brought the total 1959 payment from \$1.50 per share on 476,125 shares of stock outstanding in May 9.

### International

Restrictions on the allowable maximum size of the German Hunter (AW Oct. 13, p. 7) were lifted by the British Air Ministry. The restriction, limiting the Hunter to a maximum of four Gs at altitudes below 18,000 ft., was imposed after an accident in Germany last June. The Ministry said the accident was due to an error by the pilot who put his aircraft into a steep turn with incorrect control settings, causing a stress equivalent of 12 Gs.



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## G-E aircraft motor specialists help solve drive problem on new Collins automatic pilot

E. M. Price, Controls Engineer, Collins Radio Co. (pictured above) says: "In the development of a new automatic pilot system, we were faced with an electric drive problem. When two other suppliers failed to meet our requirements, we called in General Electric."

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## Washington Roundup

### Budget Review

USAF critics and military leaders are deep in consultation this month over the Fiscal 1957 budget, determined to achieve as much as possible of Defense Secretary Charles E. Wilson's \$100 million economy goal. Savings already are being realized in the 1956 budget and the administration wants overall air power goals not been altered. But there are slowdowns, despite which USAF says it will maintain and exceed the rate of production in overall units numbers. Output of the Fairchild-built C-123 assault transport, for example, will be delayed and there is a strong possibility that the McDonnell F-104 jet fighter will be too. The F-101B, long-range interceptor version of the Voodoo, will be pushed to hold schedule.

The North American F-100 and Lockheed F-104 both are reported on schedule, and the aircraft will deliver the fighters as scheduled along with the F-102 jet fighters. Presumably this will account for keeping total deliveries ahead of the original schedule. Because production of most important items was speeded as result of Russian program disclosed last spring, Pentagon is reluctant to discuss details of slowdown or some aircraft.

### Aircraft Profits Hearings

Debate now is that public hearings on aviation defense contracts before the House Armed Services investigating Subcommittee will start Dec. 1. Executive sessions with contractors to brief them on the subject matter to be dealt with will probably be held the last week of November. The subcommittee's schedule has been postponed about a week because of the illness of Rep. Carl Albert (D-Ga.), chairman of the Armed Services Committee. The subcommittee is headed by Rep. Edward Hebert (D-La.), but Vossen plans to participate.

At the hearings, the subcommittee plans to present evidence by testimony, starting with prime defense manufacturers. Individual contracts will be scrutinized. The subcommittee will consider whether and not fairly priced as the Huntington Road, starting with 1951 business. The contracts of engine manufacturers, helicopter manufacturers, and important aircraft subcontracts are included in the subcommittee's investigation.

### Montgomery's Visit

Britain's Field Marshal Lord Montgomery soon will report his last of appearances in this country, requested by USAF. At a visit ago, the public can expect the World War II hero to scatter passionate speeches along his path, stirring up disputes and red-hot strong conservative military minds. Lord Montgomery will be concerned that today's aircraft career will be understood by smaller and later ships, armed with missiles. He has also ideas, recently outlined in a major policy speech before the Royal United Service Institution in London. Some of his thoughts:

- "We must take as our objective bringing the three services (Army, Navy, Air Force) more closely together, even to the extent of combining them into one.
- Separate existence of the three services results, in every sphere, in waste of money, waste of manpower and waste of time."
- "We can master the air only if we destroy the enemy

on the ground. We shall never be able to do this unless we organize and control the air forces of the Western Alliance as one single military weapon of air power. . . . We should establish a single political authority for the direction of war. I would put this authority as North America. . . . I have put the military direction of the global war in the hands of a Supreme Military Authority. This Authority would control worldwide air operations, either through some agency within their own organization, or better through a commander appointed for the purpose who should be an American, since the U. S. has the only large strategic air force in the Western Hemisphere."

"We must evolve equipment weapons and techniques otherwise our aircraft, our vehicles of delivery, can be launched without the use of large airfields. . . . We must plan to disengage the tactical air forces from the role of air delivery. That part of air force will be force which has the role of co-operation with the land forces must be free to do so."

"The governing factor in land armies is that they must be reduced as far as defense weapons become available."

"We shall be fighting the air war at 700 knots or more. But we still have a logistic system that moves at 15 knots."

### Iron Curtain Going Up?

Prospects for direct air travel across the Iron Curtain, which have brightened in the past few months, get a boost from Secretary of State John Foster Dulles at the Geneva Conference last week. Dulles proposed that the Soviet Union agree to open its borders to air travel from the Western nations. Britain and France pressed the proposal. To back it up, Dulles announced that the United States is dropping its passport restrictions on travel of Americans to Russia and other eastern European countries before the Iron Curtain.

Pan American World Airways is the American flag carrier with rights to fly to Russia. In order to start service, the State Department will have to get a permit from Russia for Pan American or sign a bilateral air transport agreement.

Interest in direct air operations to the Soviet Union has revived in recent months, especially after the casual atmosphere of the July conference at Geneva. New hopes for an agreement with Russia were much in evidence at the recent New York meeting of the Inter-national Air Transport Association, where several invitations were extended to American, the Russian airline, to join IATA. European carriers would like to develop traffic between Russia and its neighbors and the Western countries, and long-haul carriers would like to operate through Russia to shorten their lines to the Far East.

### Congresswoman Cochran

That Jacqueline Cochran, wife of Army Corp. President Floyd Cochran, will make a bid for the Republican Congressional nomination from California's 20th District. The Oklahoma woman's residence of India, Reynoldsville, Rep. John Phillips, who has represented the district for 13 years, will not seek reelection next year. Phillips was nominated on the Democratic, as well as the Republican, ticket except for the last election. —Washington staff

# AVIATION WEEK

## Renegotiation Confuses Profit Outlook

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### Boeing is ordered by board to refund \$10 millions; lack of definite pattern of action puzzles observers.

By G. J. McAllister

**Washington**—The profit outlook of the aircraft industry was thrown into confusion as the vote of a decrease by the Renegotiation Board ordered a \$10 million refund from Boeing Aircraft Company to extensive public during 1952.

The set refund would be about \$3 million, Boeing said, since the Renegotiation Board figured recent profits before taxes. Boeing promptly is quoted the facts and reasons for the determination. They will be furnished to the company as appropriate two weeks later.

If Boeing does not agree with the Board's reasoning, the company has 90 days in which to file an appeal with the Tax Court of the United States. Failure to file an appeal means the a unilateral order will be issued by the Board ordering that the refund, less taxes, be paid to the government.

### Two Cases in Court

Tenno Aircraft Corp. is the only other company where it is publicly known that a refund was demanded from 1952 earnings. Tenno was reportedly ordered for the Chicago Reboing Board, but the demand was withdrawn by the Board in Washington. A hearing was held in Washington and Tenno was ordered to make a \$750,000 refund. This case is before the Tax Court.

Another aircraft company that has been ordered by the Board to make a refund is General Aircraft. The case also now is pending before the Tax Court, in which Congress appealed last May against a decision ruling for a refund of \$710,000 from profits made in 1951.

McDonnell Aircraft was ordered to make a refund from 1951 profits, but the case was settled without resort to court action.

News of action in the Boeing case set off speculation regarding the Board's policy on profit renegotiations for 1952, 1953 and 1954 for other aircraft firms. Following news of the Board's action in the Boeing case, airplane shares were generally lower. Government sources said that the Re-

negotiation Board had completed its review of 1952 profits for all but four major aircraft companies. They are believed to be North American Aviation, Republic Aircraft, Glenn L. Martin Co. and Grumman Aircraft and Engineering Corp.

Renegotiation Board would only set that "most of the costs involving aircraft companies have been completed. Our determination for the next procedure include both changes and no final reports."

### No Pattern Revealed

Reason for the confusion of the aircraft companies was lack of a pattern in board decisions. There is nothing definite that we can find in the Renegotiation Board to serve as a positive guide," said one informed observer.

"We can't tell by the speeches from Board members or testimony before Congress. The set is too hazy."

"We were not surprised at the Boeing case, we were shocked. Boeing took

a staggering, a real look at the teeth. There should be a videotape as proof—a statement and a statement."

Carl E. Hynette, director of the Renegotiation Board's Office of Review, told Aviation Week: "There isn't possibly be a definite pattern, from the act that we must understand. Every case is completely different with each factor and circumstance that we must have one right upon."

Hynette pointed to the six factors that the Board follows:

- The introductory language which is in developing contracts.
- Available information must be given to the efficiency of the production or sub-contract, with particular regard to statement of quantity and quality production, statement of cost and management.
- "Reasonableness of costs and profits, with particular regard to volume of production, normal earnings and comparison of size and production products."
- "The net worth, with particular regard to the amount and source of private and public capital employed."
- "Extent of risk assumed, including the

risk incident to reasonable pricing policies."

- "Nature and extent of contribution to the defense effort, including research and development, contribution and cooperation with the Government and other contractors in supplying technical assistance."

- "Character of business, including source and nature of material, complexity of manufacturing techniques, character and extent of subcontracting, and rate of turnover."

- "Such other factors for consideration as the Board may deem appropriate and of which the public interest and fair and equitable dealing may require, which factors shall be published in the regulations of the Board from time to time as adopted."

Hynette said that in the case of most defense companies the first factor can be applied because of the large percentage of military business. "In that case," he added, "we can make out the other factors that are applicable, using one best judgment."

The Board official said that the defense contracts are placed in even complicated manner. "We have cost-plus contracts, fixed price, incentive price and so on," Hynette said. "The difficulty of these contracts create costs factors that normally look down into expenses and profits. And these contracts apply all the way from a fast to a B-47. There simply can't be any generalization. It would be impossible to have any kind of standard set on standards alone. Our thought is experience."

The "strength" of the Board, it is publicly known, suffered a setback last week. Frank Roberts, who has been a member of the Board since it became an independent agency after the government at 1973 and its chairman since December, 1954, resigned to join the Chrysler Corp. as a Washington representative. USAF particularly thought that he had been accused. Roberts was close to Air Force problems in its relations with the aircraft industry.

### New Acting Chairman

Thomas Coughlin had been named acting chairman. Other Board members are Donald Ross, Lawrence E. Harting and Charles F. Mills.

An industry spokesman pointed out that the constitution of Congress clearing into aircraft earnings may want to call the members of the Board to obtain specific information on privately how the Board figures its determinations.

There is a legislative channel for assistance of industry funds the interpretation of the Renegotiation Act. Two most A Joint Congressional Committee on National Recession Taxation is now studying a study of renegotiation "in order to determine (3) whether there is any

possibility of extending the Renegotiation Act of 1951 beyond December 31, 1955, and (2) if any such further extension is found necessary, the extent to which renegotiations of government contracts should apply after that date."

The Joint Taxation Committee is asking U S industry groups and specific companies for their views on:

- Whether the renegotiation authority should be terminated or continued.
- Whether it should be limited in scope and to what areas of continued.
- How the present procedures for renegotiations in the Board may be simplified to lessen the burden on contractors and subcontractors as completely with the law.

Boeing has a backlog running into the billions. The 1954 renewal of the KC-95 tanker and Pan American World Airways order for 23 transports gave the backlog in \$2.1 million.

Boeing sales and earnings has a good streak since 1952, the year in which the board issued a refund. During 1952 Boeing had sales of \$738 million, a sharp increase over 1951 sales of \$517 million. Net earnings for the year, after taxes, were more than \$10 million. The company paid a cash dividend of \$1.31 a share and a 50% stock dividend.

The company had sales of \$118.1 million in 1951 with earnings of \$2.3 million. Boeing ordered the range circle of U S industry last year with

sales of more than \$1 billion and net earnings of \$37 million. During 1954, cash dividends were increased to \$5 a share, a 100% stock dividend was declared. It was the year of the B-47 bomber, the Wichita Division's 1,000th B-47 and the first order for the KC-135.

### Refunds Will Stifle

The extra profits but will not be in effect for earnings in 1954 and 1955. The Board is required to make its determinations before taxes and the end of extra profits does not affect its determinations. But it seems that net refunds will be little.

Boeing's annual report for 1954 was optimistic about prospects for final profit determination after 1957, but it was clear that the company was not "Although renegotiation proceedings relative to 1952 and 1953 earnings are currently in process," the report said, "information as to final determinations for these years is not yet available."

It is the company's opinion that earnings realized in 1954, as well as 1952 and 1953, were not excessive and that renegotiation refunds should not be requested. However, since a final determination on these matters has not been made, and since other possible contractual adjustments cannot be determined at this time, the allowance for contractual adjustments, including renegotiation, of \$2,280,000, set at times, has been retained on the balance sheet."

### Profit Data on 14 Aircraft Firms

There are indications that the Renegotiation Board is taking increasing emphasis of net worth and net profit after taxes as a percent of net worth in review of aircraft company account statements. The following financial data for 14 leading firms, listed in order since last reports filed with the Securities and Exchange Commission.

(Dollar figures in thousands)

Company	1952		1953		1954	
	Net Worth	Net Profit as % of Net Worth	Net Worth	Net Profit as % of Net Worth	Net Worth	Net Profit as % of Net Worth
Bell Aircraft Corp.	10,397	11.9	10,274	12.3	10,870	11.8
Boeing Aircraft Co.	52,294	24.6	61,553	20.1	95,294	45
Convair	47,718	15	48,018	15	—	—
Curtis-Wright Corp.	117,571	21	133,651	22.1	151,894	15.4
Republic Aircraft Co.	81,458	13.3	87,500	12.1	98,004	16.1
Republic Aircraft & Airplane	—	—	—	—	—	—
Rockwell International	79,388	16.2	71,150	19	72,214	16.1
Rockwell Aircraft Corp.	30,757	13.3	30,077	13	36,130	15.9
Lockheed Aircraft	25,499	15.6	27,868	15.5	31,099	16.9
Glenn L. Martin Co.	346	1,089.8	11,201	116.6	17,493	70.7
McDonnell Aircraft	18,778	14.3	18,118	14	18,773	14.1
North American	33,914	14.5	37,440	13.8	45,003	14.1
Northrop Aircraft	—	—	—	—	—	—
Republic Aircraft	—	—	—	—	—	—
United Aircraft	132,902	13.9	148,373	14.9	121,896	11

### Military Aviation Funds

Defense Department's net obligations were reduced last year by the change, ending at \$1.1 billion in 1954. The total \$1.1 billion, nearly twice the \$2.4 billion obligated in fiscal 1954. However, appropriations dropped \$1 billion in fiscal 1955 from a total \$4.9 billion in fiscal 1954. The total \$4.9 billion was reduced from \$4.9 billion in fiscal 1954 to \$4.9 billion in fiscal 1955.

FUNDALMENTS (500 Current)	EXPENDITURES (500 Current)	
	Fiscal 1954	Fiscal 1955
Aircraft, Parts, Tools	154,041	134,075
Army	1,748	1,748
Air Force	5,715,180	4,345,304
Naval	304,438	304,438
Total	5,975,167	4,186,565
Other Matters	317,895	345,914
Army	130,351	116,510
Naval	174,544	147,476
Air Force	434,474	1,061,477
Total	434,474	1,061,477
Equipment and Communications	1,710	1,710
Army	1,710	1,710
Air Force	253,391	230,564
Naval	17,812	17,812
Total	272,913	250,036
Research and Development	475,527	541,660
Army	—	—
Naval	—	—
Air Force	475,527	541,660

## Terrier-Armed Cruiser to Defend Navy's Atlantic Fleet Task Forces

By David A. Anderson

Philadelphia—Operational assignment of the Navy's first guided missile cruiser—the USS Boston (CAGD-1)—will begin early next year when the converted ship joins the Atlantic Fleet.

Commenced here, last week, the Boston is armed with two test launchers on firing the experimental Terrier anti-aircraft missile. Fleet operations with the Terrier follow extensive test firings of the missile, including a series from the Atlantic Fleet's experimental gunnery ship, the USS Mississippi.

The Terrier's range is about 38 miles, its speed at launch is approximately Mach 3.5.

The Boston mounts the missile test launchers well aft on the ship, above two magazines which store the Terrier in a combat-ready condition. Each battery consists of six magazines, a guidance radar installation and a launcher made up of a central cylindrical carriage (M L Carriage, Mk 3, Mod. 0) and two launchers (M L Launcher, Mk 3, Mod. 0).

Between the upper portions of the magazines and at main deck level is a small, self-contained maintenance and overhaul shop for speed to check, inspect and repair all of the Terrier.

Below the main deck are the storage bays and the automatic handling and loading equipment.

### Action Sequence

The two launchers have a sustained initial fire capability of eight missiles per minute, based on the time cycle of the loading equipment. In action against single targets at extreme range, the rate of fire could be limited by the handling capacity of the ship-based radar equipment.

When the Boston goes into action, two launchers are automatically loaded onto each launcher. To do this, the launchers swing to a vertical position, with the guide rail firing forward. Then, in the deck area, and the missiles are elevated from the magazines, engaging the guide rail as they rise.

When the rail has located and locked on a target, the missile launcher is brought into action and automatically follows the motion of the guidance rail.

From that on, missiles may be fired at will by the gunnery officer, who uses the standard quadrant technique developed for missile firings.

The Terrier is hoisted off the launcher by a large self-repelling motor. After being secured of hoisting, the booster is elevated and drops away. The sustainer motor takes over for the duration of the flight.

The missile is launched into the beam of the radar tracking the target, and intelligence built into the missile continues to track the Terrier riding the center of the beam. That, the Terrier flight path, following the motion of the beam, makes a collision course with its target.

A proximity fuse detonates the Terrier.

### Terrier History

The Terrier is the first weapons system to come from the Bureau of Ordnance's ten-year-old Section "T" contract with the Applied Physics Laboratory of Johns Hopkins University. Financed by Japanese-Korean grants in the closing months of World War II, the bureau established the missile research and development program under the code name of Bantelab.

Scientists of JHU/APL made initial studies that led to the Terrier, other phases of the Bantelab program have produced Talos, another anti-aircraft missile with target propulsion, and the Trident.

As Terrier tests made the missile look more and more promising, the Navy opened a new production plant at Patuxent, Md., and moved the operation of the facility over to the General Division of Naval Ordnance. Production began in January 1955.

The ship-based radar system was developed and built by Raytheon Instrument Corp., as part of an extensive program on guidance control and missile development which started in 1946. Under the overall project, two experimental Terrier fire control systems were installed on the USS Norton Sound and the USS Mississippi.

### Terrier Details

Patrol programs produced the booster motor, a job undertaken by the Allgheney Ballistics Laboratory, and the missile carriage and launcher. Navy personnel at Raytheon and Hughes developed launch plans for the ship-based handling gear. Actual construction of the Boston was done by the New York Shipbuilding Corp.

Terrier missiles vary in diameter, the weight of its wings, tail surfaces are fixed and for stabilization only. Plans of the



TERRIER BATTERIES replace old gun turret and gun mount, missile gun fits Boston from bow to stern, aft of funnel.

fire are rotated 45 degrees from those of the wings to eliminate flow interference.

There are four major subassemblies: forward and rear guidance section, powerplant and aft guidance section. Most of the Terrier ahead of the wings is given over to workload and firing, plus other services. The forward guidance section is the small cylinder immediately between the wings. It contains the servo motor for moving the wings.

### Missile Division

The powerplant, a vacuum motor built by the M. W. Kellogg Co., occupies the bay between the wings and the tail. The aft guidance section contains the fuel, electronic and related storage gear.

Carrier produces both guidance sections, the space containing these sections, and all the associated services.

The Boston, in the first guided missile cruiser, forms the nucleus of the Navy's first guided missile division, to be commanded by Rear Adm. John H. Sides. Adm. Sides will see the Boston in his flagship.

Commanding officer of the Boston is Capt. Charles Marshall, whose previous post of duty included command of the USS Massachusetts during the Terrier trials last fall. Normal complement of the Boston is 1,535 officers and men, of whom 103 will be missile specialists.

Later next year, the converted cruiser Cochrane will join the Boston in fleet duties.



TERRIER READY shows guide rail of launcher in firing position, missile is mounted above and forward of both launchers.





several weapons, depending upon the accuracy required. If the plane is equipped with a simple data-receiving computer, less frequent data transmissions are possible, and the data can be used to calculate automatically the computer.

In a more sophisticated system, information on plane velocity, distance and heading to the destination, could be transmitted and displayed in the cockpit.

Using a bandwidth of only 30 kc,

equivalent to the amount of radio spectrum now required by two VHF voice channels, the automatic data transmission system proposed could service nearly 1,000 aircraft simultaneously in each local area. Even so, providing that a position fix accuracy of two nautical miles was adequate.

Greater accuracy would reduce the number of aircraft which could be serviced.

One big advantage of the proposed

system, Davis pointed out, is the conservation of valuable radio spectrum, compared to presently used navigation aids.

With the presently planned network of Air Defense radars, SAGE communication network and advanced sea-weather ground processing system, "any previous spectrum of ground radio for air navigation and traffic control on the ground of non-availability must be increased," Davis concluded.

## Seaplane Evolving into Weapons System

Baltimore—The U. S. Navy and the Glenn L. Martin Co. are turning the seaplane into a weapons system.

"We have overcome the slowness and the obsolescence," a Martin spokesman told Aviation Week, "and have started to work on some of the other problems." His reference was to the new Martin P6M SeaMaster jet-powered seaplane that is revolutionizing the Navy's approach to sea warfare and even altered the concept of the Air Force as a nuclear weapons vehicle.

Last week Martin and the Navy disclosed four features of two components of the new seaplane weapons system. Prototypes of both are under construction and will be tested by early 1956. They are:

- Mobile launching vehicle that will be mounted on barges in the water near a permanent seaplane ramp at fixed Navy bases. Actually, it is a floating dolly, equipped with wheels. The seaplane will be able to tow its freighter between the horizontal floating racks, then proceed up the ramp under its own power.
- Service and deckload facility that can be used at most oceanic ports, away from home base, where the seaplane will be served from a tender.

Major component of the new seaplane striking force, the deckload will be as transportable. It will contain padded wing cradles, which are secured beneath the plane's wing and move forward with the seaplane as it enters the docking area. The dock will mount partially submerged and a series of hull pads, which can be operated individually, will be used from beneath to raise the aircraft.

To meet the dock for arriving the plane, there will be underwater air bags that can be inflated to lift the entire package out of the water.

Facilities to support vessels such as submarine tenders, transport and auxiliary ships, the service and deckload facility is the final major component of the seaplane weapons system that will make up the mobile striking force now recognized by the Navy.

Other components will be developed, were mentioned by Martin engineers.

- Seaplane landing aids that can be used at remote places on the water.
- More sensitive instruments to record rate of descent.
- New studies of weather and surface conditions, along with a device that will give the pilot full information

about wind and roughness in the water. A radar instrument for this purpose is under development.

### Finletter, Floberg On Piasecki Board

Thomas K. Finletter, former Secretary of the Air Force, and John F. Floberg, former Assistant Secretary of the Navy for Air, have been named to the Board of Directors of Piasecki Helicopter Corp. Other announcements at the regular stockholder's meeting.

• A 1956 stock dividend, worth about \$2.50 a share, will be payable Nov. 21 on all shares held of record on Nov. 7, 1955.

• The company has a contract with the government for engineering studies on an advanced version of a vertical take-off transport.

• Sales for 1955 are expected to be above last year's. Current backlog is more than 5100 orders.

• Approval was given to a stock option plan making an additional 50,000 shares available to key company officers and employees.

• Action was deferred on a proposal to change the company name.

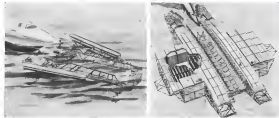


### ORDNANCE EXTRAORDINARY!

The Turner, the Navy's new all-weather anti-aircraft missile, is now being produced in quantity by Convair in the Naval Industrial Reserve Ordnance Plant of the U. S. Navy's Bureau of Ordnance. Responsible for supplying our Navy with the most effective weapons, the Bureau of Ordnance participates in vast programs of research, development, testing, and procurement. The Bureau of Ordnance facility at Pomona, California, designed and operated by Convair, is an outstanding example of government and industry working together to produce weapons systems for the defense of our country.

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DRY DOCK (right) to give seaplanes greater mobility will be tested in early 1956. Proposed mobile vehicle is at left.



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## Management

# Industry Wants Proprietary-Data Policy

One of the most important and least publicized problems for defense contractors is the tendency of the Department of Defense to seek liberal rights over the dissemination and use of proprietary information, such as patents, copyrights, and technical data.

Because it is of particular importance to the aircraft industry, Aviation Week is printing a report on the basic issues presented at a recent hearing of the Subcommittee Advisory Committee of the National Security Industrial Assn.

The paper was written by Robert E. Berk, counsel of United Aircraft Corp., and chairman of NSIA's Contract Negotiations Committee.

For several years the battle lines have been forming in the contract area in defense, from here. The Government has, on the one side, kept been reaching ever deeper into the shops and laboratories of private industry to find and possess know-how.

Industry, at first wary and only now beginning to understand the seriousness of its position, is beginning to challenge these encroachments.

Government's reach began, roughly, through 15 or 20 years ago in the area of patents, later swept on to copyrights and now embraces the whole field of technical data. In each area the opening wedge has been a demand for reports, followed later by licenses and then ownership. The license wedge dragged slowly until the end of World War II, increased during the Korean conflict and has reached a crescendo in the post-war years.

The story of this conflict is a fascinating one which ought to be told in full. However, I am going to have to confine myself to one small part. I shall try to set out and briefly discuss the fundamental issues on which industry and the Government appear to be at loggerheads today.

## 1.—Is Data Copyrightable?

The first issue—not unimportant, in order of importance, in the subject of technical data, is whether or not it is the subject of copyright?

In other words, should an item of technical data, like a drawing, at a secret process, be recorded and administered and disposed of from the point of view of the copyright law?

The Government has been saying

"Yes." And the reason they advance is that because most technical data can be related to a thing or process and because much of it could be copyrighted, therefore copyrights and technical data should be treated as a unit in regard to duplication and confusion, as assets.

I don't agree whether this treats an duplication and confusion in terms analogy, but I will make the complaint, there, that it grossly confuses the thought and promotes a violation of property rights.

It is an author's individual exercise of expressing his ideas which is copyrightable—the ideas themselves. The act of publication of a copyrighted work comes with it the free right to use the ideas embodied in it—thus, discussing it, paraphrasing it, or the like.

The man who writes a book on how to sell a hat can copyright the book, so that some one cannot copy the language and expressions he has used—but no one would expect for a moment that a purchaser of the book could say "I wish I could do it" and then go out and sell hats.

In the case of technical know-how, or technical data—is it not the language

or the whole mode of expression which is important? Rather it is the ideas or knowledge—the secret process, techniques, formulae, or whatever—which are important. There, so no one can copyright technical data which he wants to protect, for he owns it.

The Government's effort to treat technical data in the mold of a copyright problem is confusing and dangerous to industry. It is a dangerous tactic because, the average business man is likely to conclude that if the data can't be copied, his ideas and techniques are safe from the copiers.

This is not so, and to fall for this approach is to invite no further analogy, like adopting a Trojan Horse behind the lines.

## 2.—Supplementary Source

In the situation of the technical data problem, should we Government policy controlling Government Sources?

Here, the term "Supplementary Source" is often misunderstood. I should explain that I use it in the sense of one who is producing under license the proprietary right in article of another called the Primary Source. Perhaps it would be better to refer to



## North American Reactor

Power reactor for production of heat energy is being built by North American Aviation, Inc., for the Atomic Energy Commission in the Santa Susana mountains 30 mi. northwest of Los Angeles. Complete in the midwinter (or middle) of the thermodynamic cycle, and within sodium metal is the heat transfer medium for cooling the reactor and transferring its heat to the power produce. Output at the finished reactor will be about 20,000 kw. as a first test, ultimate design of about 1,500 kw. of electricity could be generated from that heat output. Chief feature of the sodium-graphite reactor is its flexibility—it can be used to produce heat continuously or successively. Structures at left is the core cover house.



## NEW ROLCO HAND TOOL\* SIMPLIFIES DU PONT RIVETING INSTALLATIONS

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1. Set controls on tool's handle unit.
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Pressure trips safety switch and causes slow, pre-heating rivet. After one-half second pre-heat, additional heat is induced in required rivet. Rivet is set uniformly and securely—



\* Operator counts rivets with one hand, quickly sets it with the other. Up to 30 Du Pont Rivets a minute can be set with the Rollco tool. 30 after finishing rivet.

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For information and specifications on this new tool, or on Du Pont Aircraft Rivets, write E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Del.

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### Purpose of NSIA

Founded in 1944, the National Security Industrial Association oversees close a link between industry and the Armed Forces.

It is not a lobbying or pressure group and does not maintain its Washington offices and staff merely to represent industrial interests in the nation's capital. Rather, NSIA says, it "provides the Department of Defense with access to America's pool of industrial ability and experience."

NSIA now has more than 600 member companies, including a substantial part of the aircraft industry. Here are its purposes, as stated in its bylaws:

- To establish a close working relationship between the Department of Defense and industrial concerns to the end that the national defense is protected and advanced.
- To provide mutual understanding between the Department of Defense and industrial concerns of problems of each to the end that such problems can be met through cooperative effort between the Department of Defense and industry.
- To provide aid and comfort to scientific research in all fields which affect the maintenance and growth of the Department of Defense.
- To assist the Department of Defense with technical information relating to national expansion and growth.

them at Proprietary Source and Labor, etc.)

Government representatives have usually contended that there is little relationship between the two problems and have recommended open technical data in recent years on the assumption that Supplementary Sources will be tackled later, maybe.

On the contrary, industry takes the position that the two are inseparable in themselves and should be considered and solved together. The reasons for this view are easy to understand.

The only category of Technical Data which industry by and large seeks to protect is manufacturing data—that is, information regarding the manufacture or production of supplies or materials and processes used in connection therewith.

The Government has no need for manufacturing data except for the purpose of buying it or another manufacturer. So it follows that industry must appraise each Government demand for manufacturing data from the point of view that the data may be used by the Government to create or strengthen a competitor.

Since constructive resistance to manufacturing data is based on fear

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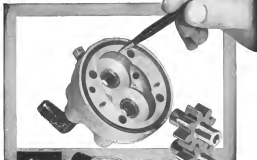
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that the licensee will be used against the contractor, it is perfectly natural that he is going to want assurance either that the Government will not hand the know-how over to another manufacturer, or that if it does, the owner will receive adequate compensation.

The bill was 1 case of its establishment and reasonable rules covering the creation of licenses and the responsibilities to be paid the appropriate source for the use of his property. It is one contention that, with such assurance in hand, the presently complicated problems involving the field of technical data would vanish like the morning fog under a July sun.

### 3—Competition With License

Should the Government promote competition between the Proprietary Owner and his licensee?

Or, in Government representation might prefer to avoid this issue. Is it legitimate practice for the Government to transmit the technical data of one manufacturer to another manufacturer to establish or strengthen the latter as a competitor?

It is assumed in either case that the proprietor never has lost concerned wholly to the use of his data is an other.

It is the general attitude within the Department of Defense that this issue must be resolved in the affirmative. This final understanding is a directed interpretation of a small paragraph included in the Armed Services Procurement Act.

That Act encourages competition by requiring use of advertised or public bids for Government procurement except in 16 specific circumstances where procurement by negotiation is permitted. This, as they see it at the Pentagon, is a Congressional mandate to "assure" competition.

So marching forward under the banner of "assurances" this leap to the conclusion that your property must be handed to me so that I can better compete with you. If one of a number of Congressmen who would be quite surprised to learn they had voted for any such principle.

Actually it is a quite apparent that what Congress intended is encourage the traditional American concept of competition—a Ford vs. a Chevrolet, a Douglas transport vs. a Lockheed, one leading contractor vs. another—not an owner of property against his licensee.

### 4—Classifying Data

Should Technical Data be classified and administered from the standpoint of

- The rights to be granted in it? (Control vs. Unavailability)
- The character of the data? (Op cultural vs. Manufacturing)
- Some other? (Copyrighted vs. Noncopyrighted)

At first appearance this does not appear to be a fundamental issue, and no doubt it should not be. Nevertheless a large amount of heat has been generated in arguments revolving about this issue.

The so-called Whiting desk, under consideration about two years ago, provided that all technical data owned by the Government should be delivered with other vested rights to use or re-leased rights—to the contractor and the Government should agree. Its plan to this approach was the impression that the contractor would be expected to make a limited rights protection such for data which in the normal operation of its business it would release from one to others in industry.

This draft represented a logical and reasonable approach, but was rejected by the Department of Defense (for which it was prepared) "because of the administrative burden of policing the way in which the data might be put."

On Dec. 1, 1955, the Defense Dept. issued a final new draft of a technical data regulation. According to an accompanying statement, its philosophy was laid to the "1) least requirements of data to that which is actually needed and 2) all for data of a kind which is needed only for the purpose for which needed."

It went on to say: "If data is needed only for contractual, operational or maintenance purposes, it should be given manufacturing administration of — proprietary nature. If data is really needed for manufacturing purposes, it should disclose all that is necessary, and the contractor and the Government should negotiate the terms for its acquisition, paying for the cost of development and data which is proprietary."

Unfortunately, the regulation draft failed completely to get into practice the lofty principles on hand, and industry was understandably critical of it.

Recently, sentiment in the Defense Dept. has swung toward classifying all technical data as copyrightable material (whether it is copyrightable or not) and thus providing an elaborate set of rules governing the circumstances under which the data may be copied, but requiring protection for the relative value when or how long of the data. This is the Trojan Horse technique referred to earlier.

It is submitted that the sound and sensible approach to this issue is to classify data according to its release character—i. e. whether it is extended



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Electronic Simulators, built by Curtiss-Wright, save millions of dollars, thousands of man-hours.

One of the greatest single factors in improving safety, and at the same time saving literally millions of airline and military dollars, is the growing worldwide acceptance and demand for Electronic Flight Simulators developed by Curtiss-Wright. Its cost approximately \$400 to hire a four-engine aircraft for an hour, but a Curtiss-Wright simulator costs only \$150 a day, and even can fly the Electronic Simulator built by Curtiss-Wright—gaining experience identical to actual flight—without ever leaving the ground—reducing multi-million dollar airport fees for training, not to mention a US Air Force study that said that a single training hour costs \$4,000,000 per year in savings by Simulators.

A simulator is constructed around the actual cause-effect relationships of the elements it represents, compatible with all system inputs and controls. The physical representation of the system is not required. This is simulator — a complex arrangement of sensing components that receive, through transducers, data from the pilot and send returns — faithfully reproducing the flight characteristics of the aircraft, in the form of sounds of the prototype. For all practical purposes the pilot is flying. The first of flying is in the response of his controls. His commands are at station. A "complete" simulator provides the pilot with the flight he might feel associated in months of actual experience — air, noise, sight, malfunction of engine, airframe. Varying the controls, even turn of throttle, can produce a wide range of results.

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So effective is flight simulation, and so vital to the commander of crew flight instruction, that the Air Force has specified Simulators for every operational aircraft type scheduled for production. Curtiss-Wright now has sixteen military and six commercial Simulator types in production and service. Major world airlines, as well as the military, have ordered and re-ordered Simulators — the most effective and economical means of developing skilled crews.

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at the whole industry ever informed data. In conducting it I should like to get into all thought of legislative rights and duties, given or perhaps instead I ask that you think of this now as the high place of statement. It is not a matter of this, the minimum, but of all points, should be at the best for the country? Not—a it best for a few companies or a few Government officials—but for all the country.

So then, the issue becomes: Is it in the best interests of the country that the Government seek to nullify the national right to use all technical data?

We think the answer is "No."

In developing our answer for the committee, I can do no better than to quote from the NDA letter transmitting our proposed regulations on Technical Data and Supplementary Sources to Secretary DTC.

"On the letter of Jan. 5, 1955, to Secretary Wilson, President Eisenhower requested his views on the country's needs in military strength, and listed four considerations applying more specifically to our military preparations. The second and third were:

**'True Security'**

"Second, true security for our country must be founded on a strong and expanding economy, readily convertible to the state of war.

"Third, because scientific progress is a constantly increasing influence upon the character and conduct of war, and because America's most precious possession is the best of her scientific knowledge, our scientific and military institutions should make maximum use of science and technology, in order to increase numbers in men."

"We can never be satisfied so long as our relative superiority in production capacity is sustained."

"We acknowledge, ladies, Mr. Eisenhower's views. Moreover we are convinced that the most way to achieve enduring industrial strength is to preserve our technological base, private and competitive economy, a basis on which our country has the opportunity and the incentive to excel. In this connection of our industrial knowledge is one of our country's most valuable assets in the competitive struggle to survive. Its recognition and protection as a factor of private property is essential to this healthy industry, the which depends in turn on national defense.

Our analysis of the industrial knowledge problem shows it to be in essence a conflict between two basic conditions: "First, from the manufacturer's point of view, know-how is a form of property which he is entitled to substantiate

the same rights of use and enjoyment as is the owner of real estate or a machine tool. This ownership of know-how, as property is that the right of ownership protects against disclosure to the public. The only way to keep the property is to keep the secret.

The second and conflicting condition arises from this, that that man, arms and circumstances when the Government has a bona fide, unimpaired need for the use of some one else's or one's industrial know-how. This need arises when it costs, perhaps not only the billions and pieces of know-how which the Government has long acquired by purchase under one or another contract but also the whole package of cooperation and assistance which a flag is bound to supply to a willing licensee.

Thus, the primary task of any policy on technical data is to reconcile these two conditions in a way which will be fair both to Government and industry. Both parties have a motive to seek security for such a solution. Industry on the one hand cannot afford to submit behind its legal property rights to the devaluation of the national defense in which Government on the other hand, must encourage the conversion of development and improvement of industrial knowledge, or put the price of a doctrine, and full of this country's technical resources and production power.

We believe that these conflicts can be resolved by the promulgation of appropriate Government regulations dealing with technical data and supplementary sources.

Such regulations should protect the owner to keep his know-how and a bona fide need for national security, production assets at which time he should test one or become in the replacement, his source, all know-how and rights and other resources within his control, whether or not the Government then has its legislative class of tech.

The owner should be compensated in the process of the Government to her from the supplementary source only with quantities of the proprietary article or as an extent of the owner's production capacity, or to permit on other basis upon the quantities produced by the supplementary source, to be paid to the primary source.

**C-46 Parts Sale**

Approximately 9000,000 worth of new C-46 parts are now being sold by the USAF on serial and proposals to be opened on Jan. 8. Material is stored at Sheela Air Depot. Detailed listings of parts can be obtained from the Sheela Air Depot, attention SHOPS, Room B, Davis, Sheela, Ohio.

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Takeoff	3,750 shp	2,240 lb./hr./shp
Max. cont.	3,275 shp	2,532 lb./hr./shp
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Cruise 85%	2,700 shp	2,287 lb./hr./shp
Ground idle	88 shp	6.55 lb./hr./shp
Engine rpm is constant 10,936 except for ground idle @ 10,950		
Max. dimensions 145 in. long, 37 in. wide, 36 in. height		



## Allison's 501: Experience Backs Civil Air

By David A. Anderson

**Indisputable**—The Allison Model 501 commercial turboprop is believed to be the engine in time for 1955 operations will be supported by an impressive backlog of military experience. This will total 160,000 hrs. to the time during previous operations, during the first American turboprop transport.

The Model 501 that goes into airline service will be the product of approximately 12 years of Allison experience with developing development that began with the Navy's T38 and T48 program in 1946.

## Flight Experience

Most of the flight experience will come from Tactical Air Command's operations with the Lockheed C-119 powered by four Allison T56 engines, the military counterpart of the Model 501.

Supplementing this logged time will be the flight tests of engines in the two Convair YC-119C transports operated by Military Air Transport Service and Allison's own Tachibana, a re-engined Convair 440.

Test runs on the ground simulating sea level and altitudinal conditions—now totaling over 44,000 hr. for all Allison turboprops—will be further increased during the next three years.

This strong foundation of test work is one of the two major factors behind General Motors' backing of the commercial turboprop engine. The other is the design of the engine itself to

exceed previous test above those for contemporary engines.

## Engine Layout

Both the Model 501 and the T56 military version are built to the same basic formula: a high compression ratio, single-shaft power section joined to a gear box in an extension shaft and two shafts.

As entering the annular inlet ports through a 14-stage compressor into a compressor combustion assembly with its burner. The discharge from the burner drives a four-stage turbine coupled to the compressor shaft.

This power package delivers 3,750 shp at takeoff for a dry weight of 1,750 lb. (its length is 145 in., width 27 in., and height 36 in.). All reported reports except ground idle are at a constant 15,520 engine rpm—on the ground the engine rpm can be dropped to 10,936. This means that the propeller will be turning at only 740 rpm, as compared with 1,035 rpm for take off.

Fuel consumption at sea level static conditions is 0.54 lb. per cshp hr., which corresponds to 5,035 pounds per hour per engine, or 5,100 lb./hr. for a four-engine installation like the Lockheed Electra. For cruise at 80% power, this figure drops to 1,996 lb./hr./engine.

## Compressor Design

Key to the overall performance of the engine is its single-shaft, 14-stage compressor designed to a compression

ratio exceeding nine to one at sea level static conditions.

Close of this high compression ratio as a design goal was made by J. C. Bottom, area chief engineer, power turbines for Allison's first turboprop the T48. Bottom's chief concern was the prospective compressor loss in between the turboprop and the compounded supercompressor engine for future commercial transport use.

Before the end of the war, Allison had run its V1710 engine as a conventional engine, feeding exhaust gas energy back to the crankshaft through complex linkages. On the test stand, the compounded V1710 had touched 5,000 hp and shown specific fuel consumption as low as 0.45 lb. per hp.

"But the more we looked at it the more we realized the new gas turbine power plant," said D. D. Gordon, director of engineering. "The more we became convinced that we would have to develop this advanced power engine and start up a turboprop engine that would do as well, or perhaps better."

That decision led to the T40 and the first program in the Allison line.

Compressor housing for the 501 is made of four steel forged quaternary, bolted together in pairs permanently. This is one of the differences between the 501 and the T56 engine, which had a two-piece welded compressor housing. At the same time Allison went to the forged quaternary, they were able to change the material to an alloy that had the same coefficient of expansion as the com-

## Design

pressor blades. This is true much of possible to reduce the blade clearance, and the engine picked up about 150 hp from that change.

Shaft assemblies are made in half rings and held in channels in each bearing held by five bolts. Interchange parts, made of soft aluminum and used in the main rings of the same assemblies.

Blade tip clearance from the housing is held to a minimum by the use of a special structure of aluminum and aluminum pads (flange joint), which is spread out, bolted and covered by a final stress case and finish.

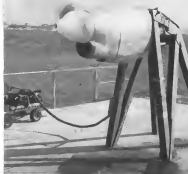
First and fourth stage of the compressor are held for starting and for ground running to the 10,000 rpm figure. This means that the shafts for the third and fourth stages are not assembled and discharged outboard of the nacelle a condition Allison was not required to meet.

Airflow capacity of the compressor at standard sea level static conditions is over 30 pounds per second.

## Diffuser-Compressor

The air flows the fourth stage of the compressor and enters a welded steel diffuser that directs the air to the compressor section. The diffuser is also a structural member that supports the compressor rear bearing, seals oil seals, oil pump and the oil fuel nozzle.

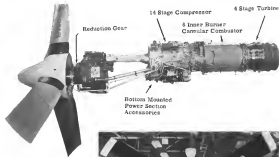
Six separate bearings are housed in a single bearing chamber formed by one piece cast and more closely. Com-



SIMULATED SERVICE test is being run on the 501 to reduce component schedule

This N.B.A. ride presented here shows the difference in driving time between Low Year Camaro "aB" and New Camaro "aB" operation, starting from steady state with full rubber, of a black number above 400000.

**LEAR** Grand Rapids Division / Grand Rapids, Michigan



ALLISON 381 and turbo-propeller as they would fit into Lockheed Electra.

over tubes runs, the fire from the two diametrically opposite runs with quarter plugs to the other four burners. Fuel nozzles protrude to the center of each burner (see above).

Under coating of the collector is still and serves as the separating structure between the diffuser section and the turbine.

Alkon's exhibit at the recent IATA meeting had a collection of computer "hot" parts, new and after considerable running. The combination here shown had a total time of 3,070 hours, only a discolouration of the metal showed that it had been used. There was no perceptible distortion.

Because the final choice of fuel for commercial operations still seems to be undecided, Alcoa engineers have designed a second system suited for kerosene. Originally the 116 combustion engine was designed for JP4 which will be the aviation industry fuel. Reynolds seems to think it can fill the tanks with JP-4 or kerosene, and light the fire," said Peters. "It's not that simple."

SPRINGS: 100 ft. radius around the 12.44 structure. Visible springs include overflows

for blades, GM iron and contains no cobalt, tungsten or columbium. Fourth stage blades are forged of S-816.

All blades are broadly fitted to the turbulent wheel zone in the two corner zones, branched in a five-tooth layout.

side the elastic deflection of the tongue itself and a self-excited, unforced shaft. Both these shafts are connected rigidly at the power input end, the other end being mounted flange-to-flange on eccentrically spaced shafts. When the torque shaft winds up under load, there is a displacement of the teeth. Each of these teeth is generating an alternating current wave and the physical displacement of the shafts causes a phase shift which can be measured and translated into torque power in the rocket.

Two drives and the extension shaft housing support the gear box, which is the power section of the 501.

The gas train releases the 13,870

All five turbine wheels are splined on a common shaft the assembly made of heat-treated stainless steel. First three stages have turbine blades cast from GMR-235, a special alloy developed by metallurgists at the General Motors research laboratory. GMR-235 has high temperature properties superior to any known material suitable

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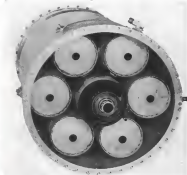
The new basic trainer makes it possible for the fledgling pilot to take a big step forward in the mastery of the techniques of being an aviator.

As in actual air training, both instructor and pilot "fly" side by side at dual controls in the ME-1. Flashes in duplicated to the point that for the first time in any ground training device, actual "Q" format cues reproduced in the cockpit and synthesized with conditions of flight.

Here again, Link personnel engineering is keeping pace with aviation progress... helping to provide better trained pilots for America's defense.



**Keywords:** mental health help seeking, decision making, FGD, B&F, SF-36, FGD-2, FGD-3, simulated mental distress, specialized computer, user interfaces, computer programs, user focus, better over time studies, possible interventions, data collection, giv-a-ways, users, and other electronic devices.



CLOSEUP shows six cross-beam rastered cross-sections of the AlGaAs SQUID.

output rpm, to 1,000 at the propeller through a two-step spur-pinion-planetary system. First stepdown is through the spur section which reduces input rpm, in a ratio of 3.125. The second step down is the planetary section which produces a reduction ratio of 4.51.

Acceleration mounting pads are on the rear face of the reduction gear box. The engagement gear housing keeps the total weight of the box down to 450 lb.

A negative torque signal vector (NTS) is built into the reduction gear assembly. The floating ring gear at the

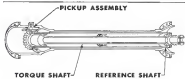
spring. The motion activates two coils in the gear box, one, raising the other, low operates a prop signal system which calls for a pitch change, toward flatter or blade work.

Propeller shaft bearing is built into the reduction gear assembly to reduce the forespanning mass of the propeller after the engine is shut down, and to prevent windmilling effect on the ground or in flight when the prop is fully feathered.

Automatic feathering of the propeller is provided in the event of engine failure during takeoff.

### Testing

Allen has completed a total of 25 176-hr trips on the TSE system.



**Abstract** shows evidence of cultural transmission for *Alburnus* 101, *Lebistes* species

RELATIONS WITH November 1, 1944

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Model 940-15 Cable Supercharger



Model 100-15 Cable Supercharger



Model 100-20 Refrigerator Unit



Model 602 Air Cycle Machine



Model 9500 Air Moisture Separator



Air Valve for  
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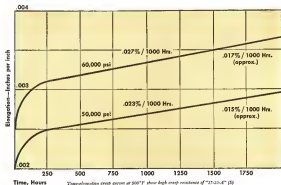


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engine. One of the engines was run through a succession of five such tests in succession to get some idea of the uniformity of the properties.

After qualifying an in first run, the engine was reassembled for a second to verify, since minor changes in configuration. After that was broken down and inspected by USAM and CMA, got worse! The engine was put back to go, and ran through three more tests. At the end of that fifth test some of the parts on the engine had in excess of 575 hr. running time. Some parts had to be replaced because they were not satisfactory, but at the end of the fifth run, there was about 93 percent of the original power value left in the engine.

Subsequently that same engine has been run through two more 150 hr. tests for a total of seven such tests.

Included among the tests for the 736 is the intermediate condition curve being a full throttle, sea level run at a standard day at 440 mph. Duration of the run is for 30 hr., or equivalent in a flight distance of 11,700 miles. During these tests the engine, delivered a total of 4,500 shaft horsepower in the process, the difference being due to the mass effect of the highspeed test conditions.

Early this year Allison simulated a questionnaire using the engine to get

### Performance Comparison

	Allison 501-D13	Rolls- Royce RB-109 Type	Napier Hood 4	Boeing EE 15
Takeoff weight	3,710	4,470	4,050	3,990
Shift horsepower	3,400	4,000	3,781	4,000
Static jet thrust, lb.	708	1,773	290	2,730
Weight, lb.	1,710	1,810	1,800	3,700
Takeoff thrust	12,812	18,000	15,300	15,500
Engine type	Single axial	Twin axial	Single axial	Twin axial
Reduction gear ratio	13.34	16.1	10.97	11.1
Compressor stages	14	9 & 5	10	
Turbine stages	4	4	3	4
Cruise rpm @ 30,000 ft. and 340 mph	1,632	1,912*	1,605	2,430
Power at full rpm @ 30,000 ft. and 340 mph	0.965	0.908*	0.973	0.900
Frontal area, sq ft.	8.9		7.5	

\* Estimated

in setting up a representative schedule for simulated engine operational flights. Out of the seven runs, the engine needs for a 1,000 hr. endurance run, giving the engine through island direct engine deceleration and test. Also, purchased an available C-130 aircraft and set it up outdoors with a Model 701 propeller. That test stand is now running with a shutdown engine in

place, the 1,000 hr. run is scheduled to begin soon. During the tests, the engine will be exposed to all the normal range of a hot West weather.

### Final Word

Allison believes it is an reasonable picture with its commercial turboprop engine. When the engine is ready for service operations there will be a look-

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## LETTERS

### Polar Competition

Having been an enthusiastic reader of your magazine for some years, I am sure you will welcome a fraction of a statement in Mr. Street's article on "Atlantic Seaward Traffic" as your October fall issue.

One minor note, SAS was reported from the West Coast direct to Europe via the "Polar" route.

While it is true that SAS introduced the first Polar service, Canadian Pacific Air Lines has been operating a Polar route from the West Coast (Vancouver, B.C.) to Amsterdam on a weekly schedule since June 1st of this year.

The requirement to date has been met with an average load factor in the 70%, figures and we are planning to double this frequency in 1965 in this equipment at once possible.

Ken Korte

Amherst in President

Canadian Pacific Air Lines, Limited  
Vancouver Airport, B.C., Canada

### Question on Quarles

That was a nice editorial on the new Air Force Secretary Donald A. Quarles (AF Sept. 1, p. 116). From an electronics point, Winston Electric does a commendable business through and we feeling in that Mr. Quarles will have to change an awful lot from his Winston Electric days.

It has been my observation that in the communications field people who build equipment in the competitive field, such as Motorola, GE and RCA, are very smart; the close guards money Winston Electric. Winston Electric's operators seem to be too conservative and too slow as compared with the rest of the communications field. In other words any of the commercial electronics people would be glad to compete with Winston Electric, and beat the pants off them.

Since you have already been an advocate of fast steering response, I just wonder how Mr. Quarles can afford his thinking. Of course, I may be wrong.

Warren E. Governor  
Stanley Ave.  
North Wales, Pa.

### Talent Pool for U.S.?

I have read with interest all the discussions put forward by readers of your magazine about who there is a shortage of engineering talent in the aircraft industry.

Believe me, I am in the same line of my letter. I would like to stress that a large number of companies are employed for a large part of the time on jobs which a high school boy could do equally well under supervision from his employer. As an applied mathematician would I feel that a considerable amount of my talent is wasted in doing calculations which require nothing more than a desk calculator. I am frankly convinced that if management was in a hurry to get work out of the talent of the new men

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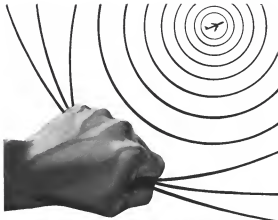


G.E. supervised test development of V-2 rocket, shown above in first launching from U.S. aircraft carrier. Today, advanced G-E design rockets like the RV-A-12 provide new dawn as large solid propellant rocket motors for use as guided missiles.

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## Stretching the Path of an Electronic Pulse

Military coding equipment takes one pulse and inserts it into a delay line and in effect sends it over a number of paths, each of different lengths. Concluding the output of the paths, gives a pulse train with pulse spaced in accordance with critical length of the path. Ordinarily the flexibility of the equipment is limited by the hand time in the delay line and the accuracy is established by stability circuitry.

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variable within its over-all capacity. It is adjustable with the greatest facility for any desired interval. The accuracy of this line is limited only by the accuracy of the measuring equipment. Moreover, the Admiral delay line requires less complicated switching apparatus. Weight and bulk are reduced. Fewer components permit faster production at lower cost. Here is one more example of Admiral's capabilities in the field of military electronics. Address inquiries for:

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placed on that job then would be a case which is long up on the shelf of engineers and from the overall picture.

However, the main type of any letter in this. Thus in Canada there is a dearth of firms interested in aircraft and engine design all day apart to the point that the U.S. industry, despite the fact that it is a number of engineers and scientists currently employed in the U.S. industry would like to further these engineers and opportunities for advancement by moving south over the border, which the firm is in the line. Applications are submitted to him and the reply is received. You are sure that we cannot supply people of Canadian or British descent? This reply is received from some firms but nevertheless some aircraft firms do take such steps. Is it possible for your magazine, to publish the conditions under which a firm in Canada (who is prepared to become a U.S. citizen) left not to leave the aircraft industry, but yes, was in doing so, can enter the U.S. aircraft or related industries. It would seem, a lot of needed effort also, if you could let the firm who are prepared to accept applicants from firms from the side of the border. Finally, if the need is so acute in the U.S., why is it so difficult for citizens of an ally of the U.S. to make for the defense of the U.S. I feel that you can do this service for your many Canadian subscribers.

BRENDAN A. HANSEN  
1110 Rydell Court  
North Kingston  
Toronto 15, Canada

[The State Department has an stated policy, on the requirement of foreign visa forms to U.S. firms. Unlawful, however the selling of foreign firms to some technicians is discouraged and has brought complaints from other governments (such as Canada) on the part of U.S.]

## On Pressure Suits

In the article in the September 1964 issue of Aviation Week (pg. 27) the statement "at 50,000 feet a descent with one port, there is no doubt about it," is wrong!! I hope the editor I speak, I did not forget this impression with you, and as I would like to be it changed to read people.

I was trying to point out that without the (pressure) suit of one that what pressure of altitudes of the suits, there would be no chance whatever to entry. I did not mean to say that in any, the suit itself, you would be, as that would be a double failure (that the cabin pressure, then the suit). This would be that the suit is, having some surplus and then having the parachute fail.

During the talk, I pointed out I felt the suit had served me in two different circumstances and was definitely required as it flights above 41,000 feet.

Archie W. (John) Schuman  
Engineering Chief Test Pilot  
Lockheed Aircraft Corporation  
Burbank, California

Archie W. Schuman has the pleasure of his readers on the letter sent to the magazine's editorial columns. ARCHAIE W. SCHUMAN is the Editor, Aviation Week, 328 W. 42 St., New York 36, N.Y. Try to keep letters under 200 words and give a general identification. We will not print anonymous letters, but names of persons will be withheld on request.



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	800 10	21 000 1/4	6000	275
	800 10	21 000 1/4	6000	275
	800 10	21 000 1/4	6000	275
RATE	800 10	21 000 1/4	6000	275
	800 10	21 000 1/4	6000	275
	800 10	21 000 1/4	6000	275
	800 10	21 000 1/4	6000	275
	800 10	21 000 1/4	6000	275
INTEGRATION	800 10	21 000 1/4	6000	275
	800 10	21 000 1/4	6000	275
	800 10	21 000 1/4	6000	275
	800 10	21 000 1/4	6000	275
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Wapacat, Schuman and Associates (1964)

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New letters reached for its role in the U.S. Navy's first multi-jet attack wingbase, the primary reason of the bar wing-off-air. Martin, XP5M-1 will be some larger and photo-reconnaissance. And it promises to be of major military importance.

For the SeaMaster is the last of a new aircraft type. And as the spokesman of a whole new age. Of the new aircraft—the SeaMaster's design—its new focus attention upon a revolutionary principle of military strategy known as the *valuable* aircraft concept. Here's why.

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Powered in the new-age jet class, it can operate from the seacoast, lakes and rivers of the world, on extended periods of duty, and independent of land bases.

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## Missile Engineering

### Holloman Commander Cites Need For Better Missile Components

By William Conklin

Los Angeles—Brig. Gen. Langston J. Davis, commander of the Holloman Air Development Center, has asked the aircraft industry to build greater reliability into its aircraft components for missiles, which, he said, require far greater reliability than those for aircraft.

Gen. Davis, in an address before a meeting of the 1955 American Institute of Electrical Engineers Technical Conference on Aircraft Electrical Applications, told delegates that the altitude temperature and acceleration requirements for missile components are, literally, "out of this world."

"I would like to emphasize," he said, "that the requirements for electrical power supplies and electrical equipment are more stringent for missiles than for subsonic aircraft. They are more stringent in terms of overall reliability and quality control and also strictly in terms of the environment."

He noted that relays, power systems

and instruments will have to operate satisfactorily in an acceleration field of between 3 and 10Gs for periods measured in minutes. Gen. Davis said shake table tests to determine the ability of the component to withstand acceleration are insufficient.

Steadfast acceleration—such as that produced by a rocket stage in orbit—also is a necessity.

#### Shake Table Tests

"We have found," he added, "in test on the shakedown that instruments which have passed standard shake table tests invariably fail under increased acceleration loading."

He asked component manufacturers not to assume that components designed for aircraft have either the design margins or reliability that is required for missiles. He cited this incident to illustrate his point.

Recently, three T-33 jet trainers landed at Yonkers Air Force Base within



### Spherical Spinner For Transonic Propeller

A spherical rotating spinner mounted at the root of the McDowell XF-508 transonic propeller test vehicle, is now NACA approach to the problem of proper timing of the propeller blades at this point.

With this new spinner, blade corners can be moved right down to the blade root instead of being into a circular section. A special tool designed to the blade corners with it so that the spherical contour of the spinner is maintained at all blade angles.

Main purpose of the flight investigation with the spherical spinner is to determine the best flow around the spinner itself, without the presence of propeller blades. Data from the flights can be used to determine pitch distribution of blades as they approach the spinner section. Local flow may be altered enough by the spinner to cause negative angles of attack, which is one of the important reasons for the flight test program.

## NOW... Perfect Repetitive Soldering



### ZEPHYR Electronic MICROBRAZER

THE ZEPHYR is the timing Accurate adjustable timed heat cycle is set by location. Then operator presses foot switch to start cycle, heat shuts off automatically, ensuring perfect solder connections even on smaller electronic components. No more burned insulation or cold joints. Exactly the correct amount of heat available, time after time. Time range of 1/60 to 3 seconds. Silver solder heating to 1250°. Zephyr representatives will be glad to show you how the MicroBrazer can save time and reduce rejects—in your plant, on your assembly line.

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MINIATURE WELDING EQUIPMENT, INC.

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# new stainless



Photograph of Contour-Welded pipe © 1978 Trent-Weld, Inc. All rights reserved.

## CONTOUR-WELD PIPE . . . BEST BY ANY TEST YOU CAN NAME



Bendable Steel  
0.01" O.D. x 1/2" wall



Flange and Flange



Rolling



Precision Tubing



Uniformity

# welded pipe

## ... with smooth inside surface free from bead or undercut ...

Now you can get any pipe TRENTWELD stainless pipe or tubing with a smoother inside surface than ever before — free from any undercut or projecting bead. Here's why . . .

With their new, patented, Contour-Weld® process, Trent puts gravity to work. Molten metal in the weld zone is always pulled down by gravity — but, in Contour-Welding, the weld's at the bottom. As molten metal is pulled downward . . . held together by surface tension . . . it forms itself into the inner contour of the pipe, rather than taking the opposite curvature as happens when welding is done at the top.

### What Contour-Weld means to You

Because Trent has always used uniformly pulled stainless steel, Trent pipe and tubing have long been known for extremely high uniformity both of wall thickness and curvature. Contour-Welding extends that uniformity to the weld zone itself. There's no projecting weld bead . . . no undercut. Flanged or flared ends are smoother, too . . . corrosion corrosion or erosion are completely eliminated. By every test, Trent Contour-Welded pipe outperforms any other pipe or tubing.

Test this exclusive new TRENTWELD stainless pipe or tubing yourself. You'll find it's ideal for any application, including such demanding uses as high pressure hydraulic lines . . . lines carrying corrosive chemicals . . . high-velocity systems. And use Contour-Welded pipe and tubing with confidence, for it's made by Trent — tube mill specialists.

## Why Trent's Exclusive Contour-Weld Process means smoother welds . . .



Here's the conventional way of welding pipe. Gravity pulls some of the molten metal down into the pipe to form a bead that is extremely difficult to remove by cold working. The cold working of the inside bead can lead to undercuts, focal points for erosion and corrosion attack. Cleaning is difficult.



Trent doesn't depend on gravity, as they put gravity to work. They flip the pipe over, and make the weld at the bottom. Gravity still pulls the molten metal down — but, in doing so, it cleanly makes the weld bead contour outward to the outside of the pipe itself. That's why there's no infinite ledge of weld metal on the internal inside pipe surface. And, even on the outside surface, the weld bead contour never cleanly approaches that of the parent metal than any other welded pipe.

\*Contour-Weld is the trade mark of the Trent Tube Co. for its process of welding pipe and tubing which is patented under U.S. Patent 2,714,092.

**TRENTWELD**

**STAINLESS STEEL TUBING**

DO NOT STEEL COMPANY, GENERAL SALES OFFICE, 1001 WEST 10TH AVENUE, DENVER, COLORADO 80202

# WHAT Sound BARRIER?

**BRILES FASTENERS manufactured exclusively for the Aircraft and Missile Industries, provide the "Sound Barrier" daily while capably binding together the world's fastest craft!**



**BRILES** bolt and nut fasteners are used in aircraft and missile construction. They are made of high strength steel and are available in a wide range of sizes and configurations.

**BRILES** fasteners are used in aircraft and missile construction. They are made of high strength steel and are available in a wide range of sizes and configurations.

**BRILES** fasteners are used in aircraft and missile construction. They are made of high strength steel and are available in a wide range of sizes and configurations.

**BRILES** also offers **MAK, AN & MS** Standard fasteners that replace Air Force and Navy Specifications in their ability to withstand impact, shock, vibration and stress.

**COLD HARDY BOLTS AND NUTS 3/32" to 1 1/4" Dia.**



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Manufacturing Co.,  
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for another of each other. Gen. Stanley Holborn, commander of the Air Force Flight Test Center and pilot of one of the aircraft, had no trouble. Gen. Donald Schenck, commander of the Weapons Development District, had an electrical power failure and had to shut his emergency system to get his gun down. Gen. Davis found his landing gear indicator giving a false reading but a quick check showed safety and he landed without incident.

## Bench Test vs. Performance

More than three of our men went on and reliable type of plane and two of the three had checked system trouble. Gen. Davis said. Had they been made, one would have surely failed—and another, lacking human judgment, might have failed to its ruin.

In another example of the importance of component reliability, he reported on an expensive and complicated missile which has been under test for about a year with little success in success. He said field tests have shown a probability of success of about 10%. The contractors on the basis of bench and component tests, had reported that reliability should be about 60%. Gen. Davis said the uncertainty in determining component reliability explained the difference.

A reliability determined in the laboratory, to be only three or four failures in 10,000 operations," he said, "could mean that under field and an unusual condition to fire or an failure per 10,000 operations and shift the reliability from 60% to 90%."

"Our missile development programs are very, very expensive," he added, "not only in cost per missile fired, but in the resulting cost of the contract itself as it drags out in the period where the contractor is demonstrating reliability before production releases."

The solid manufacturers must build reliable power supplies and electrical components because of the expense when failure means the loss of a million dollar missile.

## Rohr Reports Net Gain

The annual report of Rohr Aircraft Corp., of Chula Vista, Calif., showed a net increase of \$1,758,775 in working capital and a gain of \$2,352,977 in the net worth during the year ending July 31. Rohr has over 100,000 employees, 482,427 sq. ft. of manufacturing facility, \$101,694,448 for the previous year. President Fred H. Rohr said the working capital stood at an all-time high of \$6,616,415. The net worth was listed at \$30,471,572. Net earnings for the year were \$3,399,008.



## How Boeing engineers are penetrating the "thermal thicket"

When this look of light is turned up to 100,000 K, this temperature of the chamber, point number 750° F in a few seconds. Data from that and many other aircraft projects help Boeing engineers design systems and components able to withstand the sudden increase in temperature of transient heat absorbing engines and turbines.

More than 6,000 engineers are working the challenges of aviation's future at Boeing. They include mechanical, electrical, civil and structural engineers and aeronautical and physical scientists. And more engineers of every kind are needed for Boeing research, design and production projects, ranging from rocket power to spacecraft engines and from guided missiles to jet turbines.

Boeing engineers are investigating problems never faced before. Often they design their own jet engines, like the "space heat" facility shown here. Other Boeing designed engines in modern electronic computers of the latest type, a gas turbine engine is now capable of reflecting up to Mach 4, not chamber to put these extremely low temperatures and atmospheric pressures and the rapidly expanding, multi-million dollar Flight Test Center.

A great and ever-growing area of engineering opens: there are facilities and a room covering from involving data the very high speed planes and missiles of a few years hence. Because of Boeing's solid growth, there are more than 100,000 engineers with the company now than at the peak of World War II. A

quarter of them have been with Boeing more than 10 years and some for more than 30.

This indicates the security and growth potential of a job with Boeing. If you want to be a member of aviation's explosive team, it will pay you to meet with the engineers of a Boeing center.

- **JOHN G. SANDERS**, Staff Engineer—Thermal
- **Boeing Airplane Co., Dept. C-45, Seattle 16, Wash.**
- Please send further information by reply card.
- I am interested in the advantages of a career with Boeing.
- Name \_\_\_\_\_
- Address \_\_\_\_\_
- City \_\_\_\_\_ State \_\_\_\_\_
- Please return \_\_\_\_\_

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# PRODUCTION



RYAN PRODUCTION line turns out liquid-propellant rocket motors for President's Corp. and other defense clients.

At Ryan Aeronautical Co.

## Diversified Production Means Prosperity

By Irving Stone

San Diego-Ryan Aeronautical Co. has found a simple formula for prosperity-diversification.

Ryan's activities cover such varied fields as jet-powered vertical takeoff (VTOL) aircraft, jet-powered target drones, missiles, aircraft and engine components, subsonic and supersonic aircraft, missiles, pneumatic ducting, aircraft accessories, structures, etc. Ryan also offers research and experimental laboratories.

Within the last three years, Ryan's expanding division has tripled in size,

one out of every seven employees is in this division.

This expansion has paralleled a shift in emphasis of Ryan's activities towards greater prime contracting.

Three years ago, Ryan had a ratio of 55% prime contracting and 45% subcontracting. Today the company is doing 75% prime contracting and 25% subcontracting.

This doesn't mean, however, that subcontracting is due for a continuing demagogue. T. Claude Ryan, Ryan's founder and president of the 31-year-old company, believes that it is desirable to be engaged in both proprietary items

and subcontracting, with each representing a substantial portion of the corporation's work load.

One of the big engineering projects at Ryan has been the development of its Model 49 VTOL plane, now at Edwards AFB for flight testing. The project VTOL, powered by a Pratt & Whitney J57 engine, was in jet blast for both lift and control.

It is the first of its type to be designed as an actual experimental aircraft as distinguished from a test vehicle.

Principles of operation of the VTOL plane, have been worked out with a price Navy test rig, and there is every reason



AFTERBURNER cooling ducts (left) and pneumatic ducting sections (right) both come from Ryan's San Diego production line.

## Jet Engine Parts, Combustion Chambers, Fuselages, Avionics.



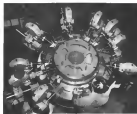
RYAN's new 5275,000 engine test cell can handle large turbojets.



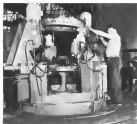
RAMJET combustion chambers get final inspection.



GIANT FIXTURE for the production of EC-137 engine systems.



RYAN MACHINE drills precision and bores for J65 turbojet.



PARTS are put into semi-automatic drilling-grinding machine.



AVIONICS GUIDANCE SYSTEM avionics laboratory checkout.



**8400 AMERICAN Horses...  
protected by SINCLAIR!**

From the day that horsepower branched the first phone into the air, oil assumed a role of increasing importance in protecting engines against enemies of heat and friction. And as bigger and faster planes stroked across and between continents, more airlines have come to realize the outstanding dependability of Sinclair Aircraft Oil. For more than 20 years American Airlines has counted on the dependability to help maintain a superb record of scheduled service. Today, 45% of the aircraft oils used by major scheduled airlines in the U. S. is supplied by Sinclair. There is no better proof of dependability.

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the last few years to develop continuous wave (CW) laser techniques as distinguished from pulsed laser techniques.

Use of the CW technique has permitted lighter, smaller and simpler equipment, according to Ryan, and additionally provides significant operational advantages over pulsed-type equipment for certain applications.

Ryan designs its equipment to be as free as possible from moving adjustments, both on the ground and operationally in flight. This is a general goal in all its equipment, but Ryan believes it has achieved the elimination of adjustments to a higher degree than is usually found in equipment delivered to the users.

Consequently, Ryan has developed recovery systems (including automatic, wave guide components, engines) which can be tested accurately in black boxes by service personnel, free of any moving components.

In all three categories—navigation, guidance and cockpit housing—Ryan is responsible for the design and development of the complete system. Many of the components have been designed and developed cooperatively with outside specialist firms. The very high performance Kfir series, particularly noted by Ryan systems, have been developed in conjunction with Viasat Associates, Palo Alto.

Ryan system engineers feel that the benefits should be applied wherever applicable, believing that this can be, for Ryan says, achieved the degree of desired reliability.

For example, in one engine component, Ryan has reduced weight from 35 lb to less than 15 lb and reduced volume by 10% by redesigning its accessories, transferring in place of certain tubes. With about 10 tubes originally in the engine mounts, all were eliminated in transition, except for five tubes in the power supply.

#### Thin-Walled Structures

Ryan's powerplants section is doing pioneering work in honeycomb structures and granular ducting.

It is engaged in concurrent development in welded aluminum honeycomb sandwiches and presently is negotiating with turbine and engine builders to supply parts for evaluation.

One of the components scheduled for design and manufacture is an afterburner duct. The turbine builder already has been supplied with panel sections for preliminary thermal evaluation.

Other possible applications of welded aluminum honeycomb structures include variable area nozzles, thrust nozzles, wing and tail sections subjected to aerodynamic heating. Tailpipes of all metal

honeycomb casings are also feasible in this application, the honeycomb would supply structural thermal loads and increased rigidity and strength.

Ryan is supporting a development program in ducting to carry high energy at least turbulent gas expansion. This is a relatively new field, which poses its own difficult fabrication problems because the material—generally stainless steel—must be very thin to keep weight down. Applications of ducting might be in heatpipes, laser cavities, or even direct cold plasma ducting for conditioning, mixing, engine starting.

Ryan believes much of the tools and techniques used in the company's extensive exhaust manifold business could be applied in the production of pressure ducting.

This type of ducting is being incorporated in a number of aircraft designs. A large plane can have 100-1,000 ft of hot ducting, ranging up to 6 in. in diameter. While Ryan's development program is still continuing, some articles already are in prototype and production stages. Prototype articles include boundary layer ducts for a fighter aircraft. Shapes of these items are very irregular and several inches in diameter. Making it welded stainless steel hot stamping, varying in thickness from .030 to .075 in. The thickness is required to take

## SOMETHING is happening at M.I.T.



We're happy to know that the same accelerated pace is taking place at every engineering school throughout the land. It means that today's exceptional development demand technological skills which have no precedent.

The striking power of a fighter plane depends upon the competency of those who designed it. Republic's engineering resources created the first U.S. 450-500... and 600 mile-an-hour fighters, it gave the war-torn Thunderbolt and Thunderbolt of war rare warhorse that powered push and coggedness.

Current proof of staff proficiency and projected thinking are demonstrated in the F-84F Thunderbolt of the Republic's carrying jet fighter-bomber, and its photo reconnaissance counterpart the RF-84F Thunderflash presently flying with some of the USAF and the NATO Air Forces.

We feel confident that whatever the trend of tomorrow's aircraft needs may be, alertness to new techniques should add a greater blend when mixed with the skill of those veterans who have established Republic's reputation.



The Viscount Present is manufactured by Vickers Armstrongs Limited

ROLLS-ROYCE AERO ENGINES FOR SPEED AND RELIABILITY

ROLLS-ROYCE LIMITED • DERRY • ENGLAND

REPUBLIC AVIATION

FARMINGDALE, LONG ISLAND, N. Y.

Designers and Builders of the Remarkable REPUBLIC AIRCRAFT



supplied by electronic and engine industry for the manufacture of various components. Many of these alloys are tried out for adaptability in fabrication techniques for the first time.

Ryan is now working with about 70 different alloys in its overall shop about 95% of these 70 alloys originally were needed and produced in the experimental department.

In the aircraft and aircraft components field, Ryan is producing or is scheduled to build the following:

• **Boeing jet tank components.** Ryan will fabricate three major sections of the KC-135 and fuselage, all fueling, and engine box structure for the horizontal tail. Fueling systems will be the largest Ryan has ever built and the largest Boeing ever has subcontracted.

The KC-135 work will be placed into the coil at the price-pointed KC-97 tanker program next year.

Ryan is testing its entry KC-135 jet with one little subcontract work over \$2 million worth of tools are involved in this jet tanker project and the testing program is still under way. Target date for testing completion is the December 1974. Ryan is building in Denver, 1974.

Tooling probably will involve between 16,000 and 12,000 units. These from small templates and from

blocks, to extensively jacking and some one final masonry job and fixtures.

Ryan also is building the master parts, tolerances held in the testing for checks that required for previous work, because of high speed of KC-135.

• **Consolidated B-44 structural parts.** Ryan has received a contract from General Electric for about half a million dollars worth of structural components for the Supersonic B-54. The bomber was reduced into initial production last year.

• **Boeing piston-engine tank parts.** Ryan has built over 700 of these, and machining parts for the KC-97 plane. Parts are still in production, with work scheduled to be placed out early in 1976.

Ryan also has built approximately 1,000 light-light, open-ended underwing fuel tanks to augment the KC-97's range and fueling capacity.

These tanks are being fabricated for the KC-97. About 90 beams are required construction of open-ended tanks, engine fuel duct.

• **F36F all fueling.** Ryan took over North American Aviation's tooling and set it up for this job. This work was started in January 1974 and delivery of the first component was made in June—about two weeks ahead of schedule. The program is expected to extend through 1976.

• **Norman and L-178 spare parts.** These include wing panels, fuselage sections and other components to keep approximately 2,000 of these craft in service. (The 2,500 originally built include 1,000 North American Avionics built Normans.)

In the high temperature components field, Ryan production shop is building these parts:

• **Afterburners and jet engine parts** for the Wright J65.

• **Components for J57 turbojet** for both Pratt & Whitney and General Electric, 30 different parts are involved.

• **Afterburners, combustion chambers, exhaust cases, etc.** for the General Electric J47. Other parts are being fabricated in limited quantities for advanced GE engines.

• **Complete rocket motors** for the Five Star Corporal. These have been in production for approximately four years.

• **Base lining and exhaust cone** for the F4U-14 jet turbojet engine.

• **Exhaust nozzles and equipment** for about 75% of the country's piston engine commercial and military transports.

Ryan also is making exhaust systems for helicopter manufacturers Pavesi, Sikorski and Bell.

The company is continuing its titanium alloy research following completion of an Air Force development contract. Phases under study include welding, machining, forming etc. Much of the results is being furnished into Ryan's subcontract work on engines and components.

Ryan's plant encompasses a 40-acre facility, with 750,000 sq. ft. of factory floor space filled with 544 million of machine tools. The company's 4,000 employees produce 545 million worth of products a year.

## Whirlwind Sets Record

The Westland Whirlwind (A45) helicopter recently flew 3,400 mi. from England to the Persian Gulf, longest flight ever made by British-built rotary wing craft. One of its engines, 270 hp, set the record will be set by Royal Dutch Shell Group (AW Feb 25, p. 9) for offshore oil drilling operations.

## Floor Space Doubled

General Mills has more than doubled its floor space for manufacturing plants in Skokie, Illinois (AW Feb. 16, p. 40) at its Minneapolis plant. Also has been increased from 20,000 to 100,000 sq. ft. A new 235-ft. long by 250-ft. diameter production hall accommodates the company's water balloons.



Now... another

Cutler-Hammer  
"first" for  
Aircraft Designers



These new Cutler-Hammer One Hole Mounting Lever Lock Switches are available in configurations to prevent inadvertent operation from any lever position to any other lever position. Intentional operation of the switch is accomplished by a pull on the lever to unlock it and prevent its movement to the desired position.

### One Hole Mounting Lever Lock Switches

Cutler-Hammer now offers the first line of Lever Lock Switches ever engineered for one hole mounting. Lever Lock to prevent accidental operation without cumbersome switch guards that obstruct good visibility. One Hole Mounting to conserve panel space and provide maximum areas for panel markings.

These are typical Cutler-Hammer Aircraft Switches... top-quality construction, rapidly engineered. Positive snap action with dependable contact pressure in the closed position and reliably secure contacts in the open position even under the severe shock and vibration encountered in cockpit aircraft service. The lever and its of special impact rubber, engineered to withstand the normal life of the switch. The seal is unaffected by ozone or sunlight, oil or water, or extreme temperatures, either high or low.

Cutler-Hammer Lever Lock One Hole Mounting Aircraft Switches are available in single, double or four-pole configurations... single or double throw, with or without center "off" position. Designed for minimum parts and weight. They solve many standard design problems. For more you have complete data sheet. Write or wire today. CUTLER-HAMMER, Inc., 1475 St. Paul Ave., Milwaukee 1, Wisconsin.

### What you should know about Cutler-Hammer

Cutler-Hammer has long held the aspect of the aircraft industry because this company has been part of the aircraft industry for 35 years. It has never been an agricultural supplier. It has produced the design when we have followed. It has been in the forefront of all cooperative activity in standardization and long-range planning. It has supplied complete lines of components, not merely the direct of direct air and most possible manufacture. Today, as for the decade past, Cutler-Hammer engineers are working closely with the aircraft industry's leaders... planning ahead, planning, designing and building.

For the future, then is the record:

1928 Cutler-Hammer designed and manufactured the first line of switches ever created specifically for use in aircraft.

1928 Cutler-Hammer designed and manufactured the first 4-pole power relay ever created specifically for use in aircraft.

1942 Cutler-Hammer designed and manufactured the first 4-pole power relay ever created specifically for use in aircraft.

1948 Cutler-Hammer started development of the first aircraft-free power relay for use in aircraft.

1952 Cutler-Hammer submitted samples and received test reports on the first mechanically sealed power relay to WADC and the Air Corps. The company was adopted as industry standard by AEC.

1952 Cutler-Hammer designed and manufactured the first one hole mounting Lever Lock aircraft switches.



### Skyraider Radome in Mating Jig

These two halves of the large radome for Navy's MD5A Skyraider are shown in mating jig at Douglas Aircraft Co. The two halves are joined by a large, complex mating jig, consisting of 10 ft. long by 5 ft. wide by 3 ft. deep in a large and complicated for composite materials. It is made in two parts which are later combined. Weld joints must not be used, to avoid interference with radar sensor's performance. When the mating halves of the hemisphere are mated up on a scale, enough holes are given for a tapered joint is left free of stress at the mating edge and the halves are closed. Finally, in the mating jig, the tapered joint is built up by alternating the material between with resin and plastic honeycomb structure. Douglas says this technique also method as used in alternate methods.

# PACKED WITH POWER



## TYPE 30E16 DC GENERATOR

With its 36-volt, 100-ampere rating, the Type 30E16 offers increased output and reliability that make it the ideal replacement for existing 30 and 75 ampere aircraft generators. In most cases, it can be used with existing control equipment—only type 30A-15 and 35A-15 voltage regulators, for example.

This generator can be furnished with either rotary or ground mounting flange and is suitable for use on Cessna 85A, P & W 345, P & W 340, P & W 369 and Wright C-61 engine.

For military applications, the generator conforms to AF Drawing 52B-5345 and will deliver full output at 15,000 feet altitude and 75% rated power at 55,000 feet.

CHARACTERISTICS	
Rated Voltage	36 volts
Rated Amperage	100 am
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Power	3600 watts
Max. No. of Ball Bearings	4 in. max.
Weight	3.1 lbs.

For complete information about Bendix Red Bank Generators . . . ask for DC and AC . . . write us today.



Write for facts and brochure: TYPE 30E16 Generator, Bendix Corp., Bendix Electric Division, Bendix Corp., P.O. Box 1015, Dayton, OH 45401. Send for literature: Bendix Corp., P.O. Box 1015, Dayton, OH 45401.

## USAF Contracts

Following is a list of announced contracts for \$25,000 and over as released by Air Force Contracting Office.

### RESEARCH-DEVELOPMENT AND TEST

**Boeing Aircraft Corp., Seattle, Wash.**—Contract for production of C-130 aircraft. 175, 100,000, 100,000.

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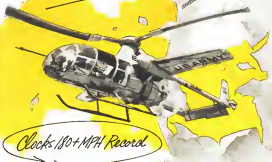
**Boeing Aircraft Corp., Seattle, Wash.**—Contract for production of C-130 aircraft. 175, 100,000, 100,000.

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**Boeing Aircraft Corp., Seattle, Wash.**—Contract for production of C-130 aircraft. 175, 100,000, 100,000.

A new kind of airplane  
makes the news  
Again!



Clocks 180+ MPH Record

... with a new kind of power transmission designed and built by FOOTE BROS.

A revolutionary aircraft, McDonnell's XV-1 Convertiplane, recently made news by completing the first successful conversion from vertical to horizontal flight . . . a totally new concept of flight which combines the vertical flight characteristics of a helicopter with the speed and range of a conventional fixed wing aircraft.

To help put this remarkable aircraft in the air required a completely new kind of power transmission for the proper transfer and the rotor which is driven by power gear located at the tip of each of the three blades. McDonnell called on Foote Bros. to design and build this highly intricate transmission. The successful flight of the XV-1 is a tribute to the skill and capacity of Foote Bros. to meet the exacting needs of America's great aircraft manufacturers. It will pay you to see Foote Bros. first—the right place to bring your power transmission and mechanical situation problems.

DAILY NEWS  
WASH. POST-HEROIC-TO-AIRPLANE  
CONVERTIBLE MADE BY McDONNELL XV-1 CONVERTIBLE  
APR 1, 1955

FOOTE BROS.  
Foote Bros. Transmission Design & Build Since 1880

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FOOTE BROS. GEAR & MACHINE CORP.









## floats gyros bring 'em back alive

It's a rough deal to locate a sinking "hot rig" in the middle of thousands of square miles of water - particularly an instrument. It takes rugged, clear-thinking pilots, and it takes rugged, accurate gyro instruments.

Floats construction of gyros built by Daystrom Pacific Corporation (American Gyro Division) ensure you rugged integrity of gyro instruments that cannot be duplicated. This means your gyros will withstand extremes of shock and vibration without affecting accuracy or reliability.

While today few complete floats possessing sufficient size and ruggedness appear now in production at Daystrom Pacific Corporation (American Gyro Division).

AMERICAN GYRO DIVISION *Daystrom* PACIFIC Corporation

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COMPASS, TURNING, STABLE PLATFORMS, MINUTEMAN AND SUPERMINUTEMAN RATE GYROS, VERTICAL GYRO PRE AND POSTURAL GYROS, ANTI-ROLL/STABILIZATION, INTERVARIABLES, POTENTIOMETERS, SWITCHES, RESISTORS, SENSORS AND ATTENUATING COMPONENTS.

## Pilots Must Be Sold on Couplers

The installation of automatic approach systems is only the first step in getting them to efficient use, according to Edgar A. Post, superintendent of operations for the United Air Lines. "Pilots must be trained in their operation, but more important, 'in the matter of selling the pilots on this use,'" Post says.

• "The pilot must be convinced that the auto-approach system is suitable to make his job easier and not to replace him."

He must be convinced that this system, which permits him to operate with a higher degree of approach accuracy to lower altitudes, is an extension on his ability, but rather a tool which relieves him of the early mechanical duties of controlling the airplane (and flying him) ... to do the work once important tasks of monitoring language performance - monitoring the approach and making decisions."

• "The pilot must be told that the use of auto-approach may lower his proficiency somewhat in making manual ILS approaches. On the other hand, some pilots have found that working auto-approach operations has helped them to do a better job of manual flying."

• "If there is a deterioration in pilot proficiency, the pilot should be told that this is the proper management has decided to pay in order to obtain improved approach success to lower altitudes when the auto-approach is working."

• "The pilot must be told that when the auto-approach has failed and instruments at his disposition are below standard minimums, to revert manual approach, management expects him to go to his objective."

the USAF, the British and several other pilot manufacturers.

The USAF tests showed that, by using a conventional computer indicator, only one out of three ILS approaches brought the plane within 25 feet of the runway centerline.

When the flight director (Zero Reader, Radar-guided Flight System, etc.) was used, two out of three approaches ended up within 75 feet of the run way.

With its outpoint and approach coupler, 100% of the run came within 25 feet of the runway centerline. Post asserted.

As a result of the better beam coupling, little, if any, low-level maneuvering is required to line up the runway when the pilot establishes visual contact.

In the event that a second approach must be executed, the coupler provides a more stable, non-manualizing starting point for the procedure, according to Post.

### "Decision Gate"

RTCA's Special Committee No. 18, formed in 1946 to study automatic flight control problems, has come up with some new terms to describe various phases of an automatic approach. They include:

• "Decision Gate: the point where the aircraft's altitude is 100 ft and it is approximately 1,000 feet from the approach end of the runway. At this point, the pilot must decide whether to continue or execute a manual approach."

• "Automatic Approach Limit: the point where the plane has reached 50 ft altitude and is approximately over the

end of the runway. At or before this point, the automatic control should be terminated.

• "Transition Coupler: the point between the decision gate and the automatic approach limit. Under the most weather conditions, the transition from automatic to manual control will take place during this interval."

### Better Bases for Lower Climbings

Special Committee 18's studies and analysis indicate that automatic approaches down to 50 ft, a climb, with weather ceilings as low as 100 feet, and trouble if higher altitudes are established for the intensity and sensitivity of present ILS systems. However, Post explains that higher minimums always will be necessary for certain airports because of terrain features, obstructions or inadequate lighting and for certain aircraft because of their flight characteristics.

Because of time lags between the instant an airplane's control surfaces are deflected and the plane takes up the new ground track, a successful landing cannot be made unless the aircraft is properly preformed, and its ground track aligned with the runway, at the instant it reaches the decision gate, 50-100 feet.

Working from this premise, the committee awarded that a landing sequence of 19 successful approaches out of 20 attempts won a reasonable approach success figure. Then SC 18 calculated what levels on base and climb slope were sensitivity, accuracy, precision and time requirements were needed to meet the 95% success probability for automatic approaches down to 50-100 ft. These results will

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MODEL 107P, right above, has been used extensively by leading manufacturers for standardizing and testing the "Lewis" quality" in the test stages. It is a standard temperature and pressure, Lewis' "Lewis" quality" in the test stages.

### STANDARD RANGES—All Models

From 0 to 100, 0 to 200, 0 to 300, 0 to 400, 0 to 500, 0 to 600, 0 to 700, 0 to 800, 0 to 900, 0 to 1000, 0 to 1100, 0 to 1200, 0 to 1300, 0 to 1400, 0 to 1500, 0 to 1600, 0 to 1700, 0 to 1800, 0 to 1900, 0 to 2000, 0 to 2100, 0 to 2200, 0 to 2300, 0 to 2400, 0 to 2500, 0 to 2600, 0 to 2700, 0 to 2800, 0 to 2900, 0 to 3000, 0 to 3100, 0 to 3200, 0 to 3300, 0 to 3400, 0 to 3500, 0 to 3600, 0 to 3700, 0 to 3800, 0 to 3900, 0 to 4000, 0 to 4100, 0 to 4200, 0 to 4300, 0 to 4400, 0 to 4500, 0 to 4600, 0 to 4700, 0 to 4800, 0 to 4900, 0 to 5000, 0 to 5100, 0 to 5200, 0 to 5300, 0 to 5400, 0 to 5500, 0 to 5600, 0 to 5700, 0 to 5800, 0 to 5900, 0 to 6000, 0 to 6100, 0 to 6200, 0 to 6300, 0 to 6400, 0 to 6500, 0 to 6600, 0 to 6700, 0 to 6800, 0 to 6900, 0 to 7000, 0 to 7100, 0 to 7200, 0 to 7300, 0 to 7400, 0 to 7500, 0 to 7600, 0 to 7700, 0 to 7800, 0 to 7900, 0 to 8000, 0 to 8100, 0 to 8200, 0 to 8300, 0 to 8400, 0 to 8500, 0 to 8600, 0 to 8700, 0 to 8800, 0 to 8900, 0 to 9000, 0 to 9100, 0 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## Antidote for Turbulent Approach

Sperry tests show that automatic approach complex really got all sides coordinated of turbulent turbulence which frequently accompanies instrument weather.

As part of an Air Navigation Development Research program, Sperry engineers made a large number of automatic approaches right down to the runway threshold under conditions of light to severe turbulence (see NACA definition).

The preliminary results of these approach complex performance tests under no-turbulence conditions are detailed for the first time below.

	LOCALIZER	GLIDE SLOPE
• Number of approaches made:		
In light turbulence	46	39
In moderate turbulence	22	17
In severe turbulence	25	15
Total	93	71
• Average deviation of all approaches from beam center at runway threshold	10 ft.	2.6 ft.
• 67% of all approaches deviated from above average by no more than	27 ft.	6 ft.
• 95% of all approaches deviated from above average by no more than	54 ft.	12 ft.

be provided in a SC-15 report to be issued soon.

The computer found that present glide slope beam characteristics are adequate. However, the specifications for the localizer must be tightened up, although not beyond the capabilities of most present, certified equipment, according to Post. For example, the 2,000 ft.-long 100 ft.-wide runway SC-15 calls for beam alignment with the runway at the point of automatic approach least to be within ± 75 ft. From personal observation at 15 different airports, Post reported that 97% of the localizers were slipped within ± 35 ft. 96% within ± 15 ft. However, present CAA measuring tolerances are ± 67 ft.

SC-15 studies indicate that a bend of 10 ft. in the beam at the automatic approach limit is the maximum acceptable. Post reports that CAA measurements show that a large percentage of presently commissioned localizers bend in within this 10-ft. limit.

### Pilot Proficiency

Without an approach complex, a pilot's ILS approach competence depends largely on the amount of recent practice and his degree of fatigue. Post says, as a result, "local-approach surface pilots may have a far higher approach success at lower altitudes than transcontinental carrier pilots who make only infrequent ILS approach trips. This is particularly true if the normal approach is made using a turning compass indicator and not a light director.

If IAL was to give every one of its pilots one hour of ILS training per month in a CV-340, it could save the company, nearly \$2 million annually, Post says, and even this is insufficient

practice to maintain a high degree of ILS proficiency.

### Approach Coupler Efficiency

The auto-approach complex, of course, is not subject to fatigue, and it retains its proficiency no matter how infrequently it is used.

Like any avionic device, it is subject to failure. However, since approach complex were first developed in the late 1950s, and first proposed for airline use about 15 years ago, the aviation industry has made significant strides in improving equipment reliability.

The autopilot and approach complex have gone through a long uneventful debugging period by the military. Autopilot and approach complex are standard equipment on practically all USAF aircraft.

However, less than 15% of the U.S. airlines are so equipped, a CAA survey shows. Approximately 275 airlines, mostly operated by United Air Lines and Pan American Airways, are now equipped with approach complex, with another 115 programmed for the near future.

Ten years ago, the automatic pilot and approach coupler looked like "conventional gauges" when compared with the few pieces of modern gear which were in control. Today, alongside an automatic weather radar, a 90°-channel VHF, a Tacan or a DME, the autopilot and coupler are viewed in a different perspective.

Now, and dozens of autopilots now available, or under development at Collins Radio, Eclipse Precision, Lear and Sperry, should provide the airlines and business aircraft operators with the same degree of reliability which they now obtain from their communications and navigation equipment.

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## A new kind of oil for a new kind of flight

Capital Airlines' swift new turbo-prop Viscounts are lubricated with an oil that didn't even exist until a few years ago.

Engineers who were then designing advanced turbo-prop and turbo-jet engines ran into almost insurmountable difficulties: there just wasn't an oil that could meet the tough lubrication specifications of the proposed engines.

Esso research teams went to work on the problem. They produced a synthetic oil which was named Esso Turbo Oil 33. This oil not only lubricates the famous turbo-prop Viscounts but is used also in advanced jet aircraft.

The triumph of Esso research adds one more chapter to an already splendid record in the development of new products for civil and military aviation.



### 1977 FILTER CENTER 00350

► **New Type Goggles**—Last of its kind, in new visorless goggles which make smooth looking of the target difficult, has caused at least one aviator manufacturer to be in courtly suit approach in the design of optical goggles.

► **North-Seeking Gun**—A new directional gun which automatically shifts itself to true north, rather than magnetic north, is with conventional DGA, has been developed by American Bosch Arms Corp. Gun sports both a free drift rate of only 0.1 degrees/second and weighs 22 lb.

► **TV Eye for Aviators**—Closed circuit television is finding increased application when the weather interferes for such things as runway viewing of the facility during low flying and for inspecting jet engine flames in test cells. The report comes from James L. Johns, general manager of Dept. Television division, Thompson Products, Inc.

► **Oil-Coated Alternator**—An oil-cooled alternator for high speed, high-ohmic security, in which oil serves both as a lubricant and cooling medium, was reported to the Los Angeles ASEE meeting by Westinghouse engineer J. J. Brown and W. J. Skilling. The 40 kw, 120/240 volt, 4800 rpm alternator described uses silicon rectifiers to direct auto ionizes on the alternator exciter.

► **Transistor Overvoltage Relay**—Novel application of transistor to nonvoltage protection of aircraft electrical systems was reported to the recent ASEE conference in Los Angeles by N. B. Schrab, Westinghouse Electric Corp., Lima, Ohio. The transistorized overvoltage relay weighs less than 1 lb., measures 2.5 x 5 in.

### Fire Control Simulator

A new interceptor fire control simulator for pilot training or use in lab studies of cockpit controls and displays has been developed by West Coast Electronics Co. of Los Angeles.

It simulates the operation of the Hughes R-4, R-5 or R-10 system during the attack phase (after target lock-on) and can create targets in straight-line or coordinated flight with the interceptor firing a lead pursuit or lead collision course.

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### Microwave Components

- Broadband wave amplifiers, a new class of linear voltage-tunable tubes, offer the band of 2.0 to 15.8 kHz. Model HD-1A, covers frequency range of 2 to 4 kHz, delivers 900 mw. Model HD-5A covers 3.75 to 7.0 kHz.



delivers 300 mw. Model HD-6B covers 8.2 to 12.4 kHz, and delivers 50 mw. Model HD-6C covers 12.4 to 18 kHz, and delivers 10 mw. Tuning voltage for all tubes is 400 to 2,000 volts. Rhegon Laboratories, Inc., 711 Hamilton Ave., Menlo Park, Calif.

- Precision drift waveometers, available in 11 different sizes to cover the frequency range of 2.6 to 90 kHz, are used to have sufficient accuracy to solve



or secondary lab standards. Units are temperature-compensated and re-tolerated by changes in bandwidth as primary. DeMoss-Bronson, 730 South Arroyo Parkway, Pasadena, Calif.

- Broadband casual directional couplers, available in four size models for the bands of 225 to 450 mc., 450 to 950 mc., 950 to 2,000 mc., and 2 to 4 kHz, provide less than 1 db coupling variation over their frequency range. VSWR of the isolator arm is typically less than 1.35. Narda Corp., Minneapolis, Minn.

### Computers & Data Processing Equipment

- Analog-to-digital converter, capable of making up to 100,000 conversions per second, with 30 million bit resolution and 0.1% accuracy, will accept signals from transducers, FM demodulators, PM or PDM recorded on magnetic tape, then

transfer, or other analog device. Device will convert to any desired digital code. Manufacturer also offers a complete conversion system including logarithmic compression unit, digital output analog-to-digital converter, and programming module. An eight-page brochure describes converter. E. R. Res Co., Inc., 1723 Cleveland Blvd., Santa Monica, Calif.

- Doppler data transfer Model 3154, converts data from a doppler radar, and associated interpolator and time code signals from a circular magnetic tape, into digital code suitable for use in a high speed digital computer. Device, which includes tape reader, provides a mounting coast of the number of doppler cycles occurring in a number of hours of second record. Accuracy is quoted at 0.1% over the integrated time period. Pottier Instrument Co., Inc., 115 Cotter Mill Road, Great Neck, N.Y.

- Digital-to-analog converter Model 270, transfers punched-card decimal data into an analog signal for automatic X-Y coordinate plotting. Device has an accuracy of 0.1% when used alone, or an accuracy of 0.25% when used with manufacturer's X-Y plotter. In-house punched cards may be read on a read display on the front of the

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instrument. Lehnscope, Inc., 805 Western Ave., Glendale, Calif.

### Portable Test Equipment

- Grid-dip meter, Model G-21 battery-operated, covering the frequency range of 7 to 120 mc, reportedly is available in within 550. Device, which can be transferred and one tube, operates for



30 hours from one set of batteries and will last 5150 Foh battery. Alto Scientific Co., 855 Commercial St., Palo Alto, Calif.

- Magnetron tester, Type 162, weighing only 15 lb, checks magnetrons for oscillation and frequency, enabling the operator to detect the presence of



gas, a started or open filament. Tester operates from 115 v., 60 cycles, and has carrying handle for portability. U. S. Electronics Corp. of America, Alexandria, Va.

- Transistorized collector, Model D-21 covering the frequency range of 20 cps to 2 mc, operates from self-contained batteries and weighs only 10 oz. Unit has a 10-megacycle input impedance on all inputs and is accurate within 5%. Device will last for 5250 4-ah battery. Alto Scientific Co., 855 Commercial St., Palo Alto, Calif.

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To scientists and engineers, missile systems technology presents unlimited scope for personal development. Those desiring to participate in a scientific effort of utmost importance are invited to address inquiries to our Research and Engineering Staff.

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## WHO'S WHERE

(Continued from page 7)

James M. Archer, assistant manager of Fairchild Engine and Airplane Corp.

R. J. Miller, manager of the Aircraft Equipment Dept. of General Electric Co. of Canada Corp.

Frank W. McVale, chief of quality control and Don L. Venable, manager of industrial information, Northrup Aircraft Industries, Calif., Div.

Max Ties Hagen, manager of manufacturing of Solar Aircraft Co. (Ciba) through Earl Nordman, national district manager, Robert Lohde, purchasing agent.

George A. Telle, manager marketing of General Electric Small Aircraft Engine Dept. Dr. James Vanden, manager of Industrial Materials Study Project in Chemical Development Dept.

William R. Butler, manager of the cargo unit, Charles Hughes, manager of shipping unit for Aluminex Company of America, John R. Tiedens, chief of aircraft maintenance across at Cleveland also development div.

Vicor H. Colson, manager of technical support, combined aircraft for the Wisconsin Mining & Mfg. Co.

Robert L. LaRue, commercial sales manager of National Co., Inc. Raymond D. Griffith, director of contracts dept.

Arthur B. Shuman, sales director, Florida Brothers subsidiary of Birmingham Corp. Frank C. Fendrick, sales manager of Colorado Iron Works Div.

Carl Hollet, senior sales manager of Ford and Telephone & Radio Co. Dr. D. B. Broadwood, Telephone & Telegraph Corp. Joseph Smith and Donald Smith, sales engineers, J. E. Van Wagoner, president of telephone product manager.

James H. Landon, Detroit sales office of Chrysler Aircraft Corp. Frederic W. McKee, Jr., manager of industrial products sales.

Arthur R. Freyheide, San Francisco sales manager of Venable, White & Lill.

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John A. Alexander, Jr., operations & service of Republic Airlines Corp.

Kenneth C. Smith, sales and service manager for Continental Airlines and Engineering Corp.

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## AVIATION SAFETY

CAR Report on Control Crash Raises Question . . .

### Did Sensory Illusion Fool Pilot?

#### THE ACCIDENT

Amesbury Airlines Flight 711, a Cessna 441, N 9421B, crashed at 2238.5 March 29, 1977. The accident occurred on an open field approximately 14 miles northwest of the Municipal Airport at Springfield, Missouri. Eleven of the 31 passengers, the first officer, and the stewardess were fatally injured. The other passengers with one exception, and the captain were seriously injured. The aircraft was of major damage to impact.

#### HISTORY OF THE FLIGHT

Flight 711 of March 29 was a scheduled operation between Newark, New Jersey, and Tulsa, Oklahoma, with enroute stops at Chicago, Kansas City, and St. Louis and Springfield, Missouri. The flight originated on schedule at 1245, made four stops and landed at Chicago at 1445. It was 21 minutes late because of Chicago traffic delay. In all other respects the flight was normal and routine.

A scheduled time change was made at Chicago with Captain John Joseph Ford (Pilot) and First Officer Charles L. Galt, and Stewardess Rita M. Vlahos, required to continue the trip to its destination. The flight proceeded normally to St. Louis and landed at 2100. While there, the crew was briefed and he received the latest weather reports and forecasts for the remainder of the operation.

Low ceiling and visibility forecast for Springfield, the next stop, indicated a possible hazard to the operation. This decision to be made by the captain was based on the existing conditions. The weather conditions also required selection of a more direct alternate airport (Reno, Oklahoma) and necessitated additional fuel. The total amount was 37.6 gallons. The decision to go to Reno, previously an important consideration, was no longer a factor. These factors combined in an overall decision and the flight departed at 2140, some 20 min. later than scheduled.

The IFR (Instrument Flight Rules) clearance issued to 711G (the former Traffic Control) specified that the flight was cleared to the Springfield VOR (Vero Class B) station on Vero (Amesbury) 14 in minimum 1,000 feet or a 1 degree or less. Captain records indicated that at departure the aircraft was headed to a sight now less than the minimum elevation, the lead was properly distributed.

#### Cleared for Approach

Amesbury 711 reported on made to the tower. Tower Radar was cleared to the tower. Tower Radar was cleared to the tower.

company that it was on Vero. It pointed along Vero. Amesbury 14 about 100 miles south the Springfield VOR station at 2145. Initial radio contact with Springfield Traffic Control was established at 2215 and the flight crew at the same time.

The approach controller transmitted the 1200 meter elevation to the flight. Reported conditions were ceiling 600 feet, scattered visibility 10 miles, and mist 12. direction 20-05. In response to the tower's question the flight then indicated a request to land at Springfield.

Immediately thereafter clearance was issued for a standard approach instrumenting Flight 711. In report after the approach and while during the procedure, tower traffic theorized the flight altered clearance to descend. There being no other traffic, the controller cleared the flight for an approach and to descend whenever it wished. At 2229 the latest weather observation for the airport, completed at 2228, was transmitted to the flight. Conditions given were: ceiling 500 feet, scattered visibility 5 miles, very light drizzle; wind speed 10.

The flight indicated the controller it would make a circling approach to runway 31, the active runway. At 2234 the flight reported, "Amesbury 711, over the tower at 24, according to the first. Approximate 100 meters later an explosion was seen and heard north-northeast of the airport and shortly thereafter the flight thereafter died.

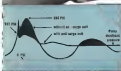
A weather observation immediately following the accident was: ceiling 500 feet, scattered visibility 5 miles, very light drizzle; wind southeast 10, gusts 20-30.

#### INVESTIGATION

An investigation conducted at the scene of the accident disclosed the aircraft had turned back landing on the northeast corner of an open field. The top of the field was 27 feet higher than the point of the initial ground aspect. This was about 200 feet beyond the beam which indicates that the aircraft at a ground approach speed was descending about 1,000 feet per minute (impact) was at an open area (collected field) at an altitude of 1,250 feet or a 1 while the aircraft was heading 120 degrees magnetic.

At impact the nose of the aircraft was depressed at a shallow angle and the right wing was slightly down. Goggles in the left seat were made by the right wing, back wing surface and the bottom of the fuselage. The wreckage path was along the impact landing at 1,000 feet and was shown with various pieces of the aircraft.

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# NORTH AMERICAN AVIATION, INC.

STACRAME

### • SAFETY

at the accident from 4°. The target position of the aircraft stopped at an equivalent position on a heading of 240 degrees. It was determined that the landing gear was fully extended and the flaps were extended about 19 degrees.

Impact tests were made and high vertical and lateral loads were developed during the initial ground contact. Then, three loads the same action from the landing gear and the lower structure appeared in the four support beams. Vertical compression loading was induced in them which did not contact the ground and deformed the sides of the fuselage, inward.

The tube wing was sagged and deformed by the impact and no explosion which occurred at the tail fin area. The left wing was torn off and came to rest at a 45-degree angle at an inverted position and each side of the main wing.

The passenger seats with the exception of the last one were torn free and forward. Examination of the wreckage, although severely damaged, showed no evidence of fatigue, cracking, overstress, failure, or malfunctioning controls prior to impact.

Both engines were torn out and broken into several sections by impact. Examination of their combustion chambers, oil pumps, oil control lines and fuel nozzles showed no damage and no evidence of the power section being in decline condition of malfunction in before being impact.

The propeller blade angles at impact were in the positive pitch range and both were positioned about 40 degrees. This indicated both engines were developing appreciable power in such rapid moments. The aircraft was turned by the engine action during its last.

### Navigational Equipment

The radio and navigational equipment was examined and although damaged failed to function, evidence of malfunction or failure was not found. Examination of the engine, propeller, and fuel system was made and no evidence of malfunction or failure was found.

Supporting the physical examination of the engine, propeller, and fuel system was the actual radio control system. The radio, which was not damaged and not malfunctioning, was not damaged and not malfunctioning.

It was found that an Air Defense Radio Installation was present, which was not damaged and not malfunctioning. Photographs of the radio control system were taken and the photographs were taken and the photographs were taken.

The pictures were taken at definite intervals at low altitude prior to an automatic crash, during the flight sequence. These pictures were taken at an altitude of 10,000 feet and the pictures were taken at 10,000 feet.

Automatic crash procedure for failure of the radio control system. The pictures were taken at an altitude of 10,000 feet and the pictures were taken at 10,000 feet.

near Victor. It was then following Victor 14 on a heading of approximately 240 degrees. The flight path of the aircraft was determined by the flight path of the aircraft and the flight path of the aircraft.

The radio control system was not damaged and not malfunctioning. The radio control system was not damaged and not malfunctioning.

### Approved Approach Procedures

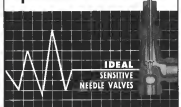
Then, the first CAA approved approach procedure for the type field approach—low frequency range ap-

proach, the VOR approach, and the ADF (Automatic Direction Finder) approach. The VOR facility was being used during the approach of Flight 71.

The VOR instrument approach procedure consisted of a flight from 54. Later, it was determined that the aircraft was sight upon reaching the VOR and established an estimated track of 15 degrees. It then began a procedure turn to an estimated track of 50 degrees. This track, if extended, will pass over the station again and approach the standard position of 100 degrees.

The standard, 2,500 feet in a 1 L, during the standard, 2,500 feet in a 1 L, during the

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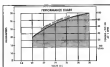
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3. Speed: 100-240 rpm.
4. Torque: 100-240 lb-in.
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90. 1/2, 1, 15 V.D.C. output
91. 1/2, 1, 15 V.D.C. output
92. 1/2, 1, 15 V.D.C. output
93. 1/2, 1, 15 V.D.C. output
94. 1/2, 1, 15 V.D.C. output
95. 1/2, 1, 15 V.D.C. output
96. 1/2, 1, 15 V.D.C. output
97. 1/2, 1, 15 V.D.C. output
98. 1/2, 1, 15 V.D.C. output
99. 1/2, 1, 15 V.D.C. output
100. 1/2, 1, 15 V.D.C. output



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 procedure box, and 1,367 feet in a 1,080  
 feet above the airport when over the sta-  
 tion adjacent to the airport.  
 The existing runway center line  
 was, Center 100 feet and width 120 feet.  
 The airport field elevation is 1,267 feet  
 in a 12.

**Radar Evidence**  
 During the public hearing a company  
 witness stated that under the circumstances  
 he believed the approach path depicted by  
 the radar plot was in accord with the ap-  
 proach of VOR instrument approach pro-  
 cedure. He stated that considering the de-  
 sign of the tower to the airport from Runway 14,  
 the distance involved, and the air traffic  
 control, compared to the specified minimum  
 altitude, for the reason the approach in  
 (visual) was a safe and accurate inter-  
 pretation of the VOR instrument approach  
 procedure. He believed the approach was  
 within the limitations imposed by the  
 Civil Aeronautics Administration and there-  
 fore was safe.

A representative of the FAA, Mr. Ar-  
 nold Smith, Agent assigned to the case,  
 advised that the approach was not  
 in the radar track of Flight 711 was  
 not consistent with the requirements of the  
 VOR instrument approach procedure.

He stated that the full procedure for  
 Springfield, considering the facilities in ex-  
 pected to be completed when instrument  
 conditions exist. He said that the purpose  
 of the instrument track, the procedure was,  
 and the instrument track is to provide a flight  
 to descend to a lower altitude within  
 a known area. Three point light  
 was established in the airport with a  
 facility, check after that track has been  
 established, and also about the area, some  
 time to complete full contact (visual) be-  
 fore visual contact is made for landing.

The witnesses of this witness was based  
 upon Civil Air Regulations, Section 61.40  
 and 61.154.

Captain Faght, because of severe injury,  
 was unable to remember any of the events  
 of Flight 711. He stated, however, that  
 his interpretation of the instrument ap-  
 proach would not permit descending the  
 instrument landing procedure, and the  
 instrument track of instrument conditions pro-  
 vided.

#### Passenger's Testimony

The surviving passenger described the  
 flight as very pleasant before the accident.  
 Nearly all agreed it was smooth and fine.

At 10:45 instrument approach procedure  
 When instrument conditions are necessary, a  
 standard instrument approach procedure  
 is normally followed by the pilot.

(1) A different instrument approach pro-  
 cedure is normally followed by the pilot  
 when the pilot is not qualified to fly the in-  
 strument approach.

(2) A different instrument approach pro-  
 cedure is normally followed by the pilot  
 when the pilot is not qualified to fly the in-  
 strument approach. The instrument ap-  
 proach procedure is normally followed by the  
 pilot when the pilot is not qualified to fly the  
 instrument approach.

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 295.5 lbs.
3. The contour shape of the mill-rolled  
 section saved additional time and money  
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experts should attend several. One, as several engineers, and there was no indication of engine malfunctions. Numerous passengers observed the "Prince Seat 303" was coming on and realized that the aircraft had passed down the aisle, clanking their belts. During the entire flight and read the content of report that was no warning of the crash or indication of an emergency declared in the passenger cabin.

Two passengers noted the flight between St. Louis and Springfield was smooth, almost as between cloud levels. They stated that during the latter part of the trip the engine power seemed lowered and the aircraft descended and entered the clouds a half at times tilted and that view of the wing lights. They stated that until the aircraft descended below the clouds they could not see any lights on the ground. Several passengers said they saw weakly scattered ground lights through a light mist shortly before the report. One, seated on the left said he saw lights on the left in the area and area of the airport and two minutes before the crash.

A passenger seated on the right in the last row said was able to see what the dash lighted pilot compartment but was unable, to his credit, of the pilot's duty was, who was holding the controls. He stated that an instant before the crash he heard one of them say, "not in an engine light and warning report." "My God we are going to hit the ground." Further down was a seat of power and the report followed almost simultaneously. No one others heard the accident of power.

Three witnesses were and no record is to indicate the turn in the report on radio while the aircraft was in the clouds or after it descended below them.

Several ground witnesses located from about 34 miles south of the crash range station to quarters in the report were the aircraft. A newspaper located 31 miles south of the crash saw the aircraft below the clouds, looking southward toward the report, and was captured in the last bit of record quite low. Another witness saw the aircraft pass over at a very low altitude and was at distance to descend and it struck the ground less than a mile away. A witness on the report indicated the aircraft came into view north of the airport area, it passed toward the airport, apparently from behind and then descended and disappeared behind surrounding terrain. He was a first time local apparent engine crew, 32 witnesses who saw and heard the aircraft, believed it was low compared to other flights. They all believed the record of the engine run not real.

### Crew Qualifications

Investigation disclosed that the crew was qualified for the flight, and had received the required preflight pre-pilot. Captain Pugh had flown into Springfield Airport about 51 times. Early in the morning of March 18 he was scheduled for another flight that evening and was ordered to fly, however, a scheduling revision required him to be required in flight 711. As a senior captain he was qualified crew several times, including the one involved.

First Officer Wilkins, although by a

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reduction in time, had recently been completed by the company and after completing the checkout requirements was assigned to Flight 711 as his last flight. Captain Popish knew this, having been informed under a normal procedure of the company in the event of a bad operating pattern. Many witnesses with whom the crew members had personal contact before and during the flight stated that both appeared to be in excellent spirits and normal in every respect.

At 1230 a sudden cold front extended northward from Annette to near Wichita and Chicago. There was snow over eastern and central and it bordered the southern boundary of a cold air mass which was moving northward from the Plains States. Relatively low pressure in east of the surface in Oklahoma, Texas, and New Mexico with a trough extending northward into Missouri and Illinois.

As a result of the situation and other factors considerable fluctuations were noted in Missouri and a solid deck of low clouds extended to the north and west of the cold front. The front moved southward during the afternoon and evening of March 20 and passed Springfield at 2300. The passage was immediately followed by a small pressure rise.

When Captain Popish reached St. Louis he called the Annette Airlines dispatcher at Ft. Worth by long distance telephone to determine whether or not the clearance status permitted the flight to continue. At this time the time was expected to pass Springfield about the time the flight would arrive but the severe thunderstorms had dissipated and were no longer considered an obstacle. Low ceiling and visibility were reported, however, and the possibility that Springfield would be below minimum was reported.

Weather observations for the Springfield Airport were taken on the airport and accompanied the use of the anemometer, an electronic measuring device for determining the height of the ceiling. The weather observations indicated no serious ceiling without any tendency for a considerable period before and after the arrival. These observations reflected only the conditions that existed at the airport.

Meteorologists who worked at the public hearing stated that weather conditions at the VOR station were not definitely known, however, based on their training and experience and considering all the factors involved, different conditions at the time of the VOR station were considered possible but not probable.

## ANALYSIS

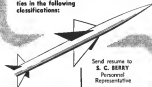
After radio contact was established with Springfield Approach Control the flight was given an approach clearance which required it to report upon reaching the VOR station and when it began the procedure turn.

Subsequent to this clearance Flight 711 received another which was "hold for an approach." The clearance, in effect notified the flight there was no other traffic in the area and the reporting requirements and permitted the flight to make any approach it desired. The clearance, however, did not permit or intend to permit any other

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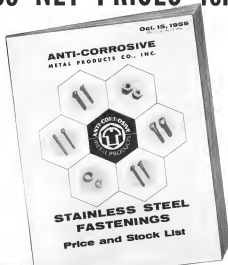
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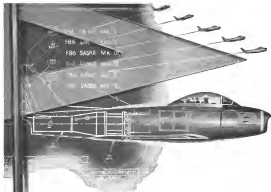
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approach except the full instrument approach if instrument conditions prevailed. From the flight's arrival to the VOR station, no impact over the station, the time of the windset and the radio plot it is clear the complete instrument approach procedure was not made.

### Visual Contact Possible

Weather conditions at the Springfield area strongly indicate the top of the overcast was between 4,000 and 4,500 feet as a 1 and the overcast at the airport was without breaks with its base about 500 feet above the surface. Analysis of the altimeter also suggests that these conditions prevailed at the time of the VOR station. It is therefore inferred that the entire procedure instrument procedure should have been made.

The third investigation suggests the possibility that the flight may have obtained visual contact with the surface in some altitude before visual contact was made. The station it was possible for the flight to have proceeded visually to the airport without following the instrument approach procedure. The action would also have been permitted under emergency conditions, however, based on all the available evidence it is believed that no emergency occurred.

From the testimony of several tower pilots it is apparent that the aircraft was nearly on the 175-degree inbound radial to the airport from the west and that it was flown below the minimum for visual conditions at that time. During the time the aircraft was in the area, relative positions over the ground required by the approved VOR instrument approach procedure. From the evidence available during the approach, the aircraft was also apparent in the visual conditions for an approach to the airport before making a land. The height of the line of the overcast and the distance involved, however, did not permit the aircraft to descend below 1,000 feet per minute.

### Sensory Illusion

It will be recalled a passenger local one of the pilots reported before the accident, "My God, we are going to hit the ground."

This and other evidence indicates that the crew was not aware of the aircraft was so low and that it was descending. It is possible that at the time the pilots were deviating from attention outside the cockpit and possibly toward the distant airport lights while flying over the dark and rapidly lighted terrain in mountainous isolated areas. An important psychological factor enters into an approach under these conditions and has been combined a factor in other accidents or near accidents.

The effect of such conditions has been flight crew on a continuous progression of altitude and/or the illusion that the aircraft is flying horizontally with respect to a dis-

1. Reference "The January Edition of Pilot," by P. P. Conway.  
2. C.A.B. Accident Investigation Report, SA-912 and SA-911.

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put light in group of lights when in safety the area outside of the aircraft is up to three. Under such circumstances, a flight in previous missions the crew have not realized the situation and have not been warned by their physical sense of the danger. Other cases in similar situations have looked off trailing aircraft or so badly that a ground object below within the power.

The likelihood of this situation relative to Flight 711 cannot be positively determined because the primary evidence of it would be provided by the crew's testimony, which was unavailable to the Board. However, the members of the commission of the and other witnesses have confirmed to the captain.

#### FINDINGS

On the basis of all available evidence the Board finds that:

1. The company, the aircraft, and the crew were severely criticized.  
2. The flight was poorly supervised and directed according to standard flight rules.

3. At the St. Louis departure the aircraft was loaded to a weight that the crew was ill-equipped and the load not properly distributed.

4. In some weather conditions were severely restricted and the conditions at Springfield were better than expected.

5. Weather conditions at Springfield were above the maximum for an aircraft. Although the crew was to make a VOR instrument approach and to circle for the landing.

6. The flight did not receive the CAA required VOR instrument approach procedure but proceeded directly from the status toward the report.

7. Analysis of the meeting weather conditions indicates that before the aircraft turned toward the report visual reference with the ground was possible but not possible at the report altitude.

8. While approaching the airport the aircraft was within the VOR instrument approach procedure and was then severely below the aircraft for normal order.

9. The aircraft descended until it struck the ground approximately 11 miles north-northeast of the airport.

10. There was no evidence from radar indicating indication of failure of the aircraft and there was no evidence of an emergency descent of the aircraft.

#### PROBABLE CAUSE

The Board determines that the probable cause of the accident was a descent to the ground while approaching the airport covered by the crew's testimony. The first flight subcommittee and a possible memory element going into an erroneous impression of the altitude of the aircraft.

In the Civil Aeronautics Board:  
Ron Riden  
John Lee  
Chris Grant  
Hans D. Dwyer  
Joseph F. Adams, Vice Chairman, did not participate in the adoption of the report.

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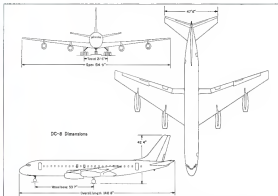
There's something about the bearing of these men of the RCAF — something in their confident stride as they return from an interception exercise — that speaks of a job well done. For many months they received intensive training to prepare them for exercises like this and for the dark day when every aircraft may actually appear in the skies over Canada. And what of the planes they fly? Avro Aircraft's CF-105 all-weather night interceptors have greater range, more power and more lifting force than any all-weather night interceptor in service anywhere. Now and even powerful flight projects are constantly underway in Avro Aircraft's extensive engineering division, staffed by the most outstanding research, design and development engineers in the aeronautical industry.



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## AIR TRANSPORT



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By William J. Conklin

Santa Monica-Challenging to do more and better competitors to match the economy and performance of the DC-8, Douglas Aircraft Co. last week disclosed design details of its new commercial jet transport.

Douglas aerodynamicists, in close consultation with American Airlines, revealed that they have evolved an entirely new and for the wing which will enable the DC-8 to achieve a higher speed with less wing sweep.

The aircraft is a development of a National Advisory Committee for Aeronautics (NACA) which was first made public some 20 years ago and not yet widely considered feasible for high-speed aircraft.

### More Payload

The company is guaranteeing that the DC-8 will carry more payload farther than any other jet-engine domestic or foreign now being offered to the world's airlines. Its designers say it will do this with an economy not

possible that of the DC-7C by as much as 40% over long range routes and 25% on 800 mi. segments.

One of the primary Douglas design objectives was to come up with an aircraft that would require as little pilot attention during its possible, particularly in regard to handling characteristics at low speeds near the ground.

"In the design of the DC-8 every effort has been made to retain, as clearly as possible, the landing, take-off, and ground handling characteristics of the current transports," says DC-8 project engineer Ivan L. Shapiro. "This should accommodate the present pilotage experience level, and reduce the economic burden of transition to a new one, while maintaining an increased level of safety at possibly the same ceiling and visibility minimum."

How closely this has been achieved can be judged from the fact that the DC-8 is expected to have ground proximity characteristics almost identical with those of the DC-7. Speed for the downwind leg approaching an airport will be exactly the same as that

of the DC-7, with less leg speed actually a slight lower. On both legs, the jet will require about 5 deg. more drag.

DC-8 speed over the lower will be about five knots faster than the DC-7, with stall speed four knots faster, at 50 knots with 30 deg. of flap.

Much of the credit for its conventional characteristics must go to the aerodynamicists who, with the help of computer analyses and wind tunnel testing, evolved the new wing from the recent NACA studies.

### Lower Sweep

Originally set at 35 deg., sweep of the DC-8 wing now is fixed at 30 deg.

"Adding the sweep plane makes it possible to use a conventional aircraft control system without reversal problems," reports B. S. Sherell, DC-8 aerodynamicist. "It is not necessary to go to speeds for lateral control at high speeds."

He also points out that the new wing is swept the more it has a tendency to encounter tip stall at low speeds. Douglas has eliminated the need for any





## At Home With the Otter

Two de Havilland Otters of the Philippine Air Lines (above) fail to attract voters badly prepared to look on the edge of the state as a sign, Manila, where the plane was parked and seen. P.A.C. men 11. Otter to appear into state; vehicle-inaccessible island villages and plantation (AW Oct. 9, p. 16) Typical landing strip (down from the plane) is notched into the shore at least 400 yds long, surrounded by dense jungle. This strip is being to approximate the state width of a two-lane highway. Its surface consists of grass and solid earth.

## Court Backs Ashbacker Doctrine

The legal principle known as the Ashbacker Doctrine, which the Civil Aeronautics Board has applied when considering two applicants for service on the same route but because of an extraordinary established by a court decision in the Eastern route consolidation case.

In the decision, the U.S. Court of Appeals granted Delta Air Lines request for a stay in the case and, at the same time, issued an order of temporary injunction of the Ashbacker Doctrine.

The dispute arose when the Civil Aeronautics Board decided not to include a Delta proposal for new services between Memphis and Cincinnati in the Eastern route consolidation case.

When the court and the CAB, the court has decided to stay the consolidation portion of the case and let the CAB go ahead with the east-west part.

### An Empty Shell

Early in October, the Board decided to add Delta's application to the case, but Eastern and American Airlines have filed petitions for reconsideration of the move.

The court's decision to go ahead with its review of the case may be altered when the CAB decides the reconsideration move.

The court found that CAB's error "is that it believes it can leave the Eastern application on its merits without hearing Delta and a related decision finally whether Delta has a right to a hearing as a potentially exclusive applicant."

If CAB should decide to exclude Delta in the case which it acts on the petition for reconsideration, the court might decide to drop its review of the proceeding.

It would mean that where two applicants for a license are mutually exclusive the agency could hear one of them upon its merits and as a final rule upon exclusivity and award the license without ever hearing the merits of the second application. Such procedure would not protect the rights of the second applicant, as no Ashbacker.

### Entitled to Hearing

In its opinion, the court said that the doctrine means that where the applicants of a line qualified applicants for a license are mutually exclusive, each applicant is entitled to a comparative hearing and consideration.

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## Trans-Texas Gets New Routes; Skip-Stop Operations Approved

Washington — Civil Aeronautics Board awarded new routes and relaxed operating restrictions on Texas-Louisiana Airways on land routes in the Trans-Texas several case.

The second case originally dealt with removal of the local airport's restriction. Since Trans-Texas secured a permanent certificate last month, the current decision is concerned only with new services not included in the permanent certificate.

New routes were awarded to Trans-Texas between Laredo and Dallas, Tex. via San Antonio, Austin and Ft. Worth, and between Skip-Stop and Lufkin, Tex. via Lake Charles.

The Dallas-Laredo route will be operated by Trans-Texas for a seven-year period. The current case anticipates an increase in flights on the new route at Laredo McAllen or Harlingen, Tex. and must serve all points on the route.

### Tap Potential

The CAB said that it is concerned about Texas Airways' service at Laredo hasn't set the air service needs of the community.

Certification of Trans-Texas on the route will serve adequately by the traffic potential between Laredo and Ft. Worth/Dallas, according to the Board.

The extension of Lake Charles and Lafayette into Texas-Texas' system is designed to improve local service between the two points and other points in the Texas-Louisiana area, especially Dallas and Ft. Worth. The route is currently served only by Eastern Air Lines.

The CAB refused to issue Langue, Tex., an alternate point to Texas-Texas between Dallas and Memphis, finding the petition filed at Longue, a full requirement of service in Dallas and Skip-Stop. The restriction is lifted which prohibited Trans-Texas from serving Dallas and Skip-Stop, or Dallas and Longue-Skip-Stop-Glennville on the same flight.

### Skip-Stop Authorization

Board is intended at Laredo and Charlotte, and Dallas Air Lines is authorized at Tyler and Longue during the period Trans-Texas serves these points.

It is necessary CAB practice to inspect land service at points where an experimental local service is being authorized.

To improve service at Ft. Worth and Dallas, the Board issued Ft. Worth a terminal point on September 5 and 6

of Trans-Texas' route and specified that all flights serve Dallas on those flights must also serve Ft. Worth. These segments run from Dallas/Ft. Worth to Houston, Skip-Stop and Memphis. Authorization for skip-stop service was made by CAB to give Trans-Texas greater operating flexibility. Under the authorization, the carrier must schedule at least two nonstop flights a day at a point before it can be skip-stopped and must make at least two stops between terminals on all flights. When skip-stop is required, the carrier can skip-stop at its discretion in scheduling its operations.

The skip-stop authority is subject to two restrictions. Flights between Little Rock and Dallas/Ft. Worth and between Little Rock and Memphis must make at least one stop. Flights on the new Laredo-Dallas route must serve all intermediate points.

## CAB ORDERS

### GRANTED

C-5 Overseas Airlines an exemption to reduce out-standing flight between New York and points in Europe present to a carrier with the exemption and National Airlines.

### APPROVED

Resolution between various carriers applied by the International Air Transport Association to the Eastern route consolidation case.

### ORDERED

Supplies of a reduced fare between San Diego and San Francisco extended to Jan. 31, 1964, to allow additional time for completion.

Extension of the period of the outbreak and local service to the decision of the no-show and multiple services problem to provide an additional three months.

### DISMISSED

Continental Airlines' application for a certificate to serve between Miami and Denver and Dallas over the applicant failed to secure a Board approval.

Northern Central Air Transport's application for a certificate to serve between Dallas and Memphis, Tex., and Dallas and Springfield, Mo. and Jackson, Miss. over the applicant failed to secure a Board approval.

British Overseas Airways Corp.'s application for a certificate to serve between London and San Francisco as an additional terminal, at the request of the applicant.

For American World Airways' application to serve Venezuela, Cuba, between Miami and Houston at the request of the applicant.

Northeast Airlines' application for extension of its New York-Los Angeles-Boston route to Indianapolis, Ind., and removal of a two-stop restriction, with the removal of the applicant.

Trans World Airlines' application against the Trans World-Texas and Travel Agency, over the applicant is no longer being reviewed in the Trans World-Texas and Travel Agency and the complaint is moot.

For American World Airways' application to serve St. Louis, Miami, West Indies, at the request of the applicant.

### DEFIED

Phong Tung Lach's application for an exemption to reduce out-standing flight between Honolulu, Hawaii, and New York carrying military personnel on biology.

## SHORTLINES

American Charming Express reports airline revenues of \$57,398,354 in September, compared with \$42,458,356 in September, 1954.

American Airlines carried 667,900 passengers, 307,000,000 passenger miles in September, an increase of 22.5% over September, 1954. Cargo traffic was 6,511,000 pounds, a 14% increase, mail increased 10.2% to 1,193,000 tons, and express was up 27.5% to 1,097,000 tons.

British European Airways carried 66,199 passengers between its London and the Channel Islands in the first nine months of this year, an increase of 18.5% over the same period last year.

Continental Air Lines has installed a Teletype-Airline, Douglasville, Georgia, to serve in TATL to increase efficiency on its transatlantic telephone network.

National Airlines reports record year for traffic in Florida this year. During the first nine months of the year, National carried 215,845,000 passenger miles, an increase of 18.2% over the same period last year.

Norfolk Southern Airlines carried a net profit of \$50,711 after taxes in September, bringing the net for the first nine months to \$115,578. The airline carried 45,135 passengers during the month.

Shink Airways has cut one hour and 30 minutes from its night DC-6A schedule from New York to Los Angeles and San Francisco via Chicago. Total time is now 11 hours, 45 minutes.



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## Civil Aeronautics Board's Free Riders

Ron Ritzky has done much in his eight months as chairman to restore the prestige and vigor of the Civil Aeronautics Board. He has particularly stressed its quasi-judicial status and the necessity for maintaining scrupulously ethical relations between the Board, its staff and the airlines they are charged with regulating.

Thus, it is surprising to see Ritzky sponsor and promote CAB approval for a policy of free airline rides for Board staff members that is certain to raise grave ethical and legal questions and cannot help but undermine much of the good work done recently to bolster the Board's ethical standards and prestige.

Chairman Ritzky and the Board majority who voted for the free ride policy believe it is a good thing for staff members to get out around the airlines and obtain first-hand operational experience. We agree that this is a good idea. To do their regulatory job well, CAB staff members need a broader view of airline operations and problems than can be obtained from behind a Wash. region desk.

However, this travel necessary to performance of their duties should be done at government expense and not in a free ride provided by the airlines subject to the CAB regulations. Many other departments of the government such as the Civil Aeronautics Administration, National Advisory Committee for Aeronautics, State Department, USAF, Navy and Army all use commercial air transportation to move their personnel. But they pay their own way out of legally appropriated travel funds and do not ask the airlines for free rides. Only the Post Office Department, which places federal mail

on the airlines, requests the privilege of free transport for postal inspection on official duty.

Chairman Ritzky and the other Board members who voted for free airline rides certainly must be aware of the stretch of concepts that arose from the free ride policy of U.S. railroads in the 19th Century. With this in mind, Congress wrote specific provisions against free airline transportation into the Civil Aeronautics Act of 1938 when the Board derived its authority.

Some point has been made by the Board that the free airline rides by staff members will be on a "space available" basis and will not deprive revenue passengers of a seat. If this is true, we wonder if the taxpayers will appreciate paying CAB staff members an extra \$12 per diem while they wait at some airline whistle stop for available space.

If the Board believes it is a good policy for its staff members to visit operating airlines, and we agree that it is, they should ask funds for this purpose to the CAB annual budget request instead of accomplishing that legitimate objective by establishing a free ride policy that violates the public ethical standards outlined by President Eisenhower in his historic comments on the Harold G. Harbo case.

We agree with the dissent of Board Member Charles Garvey who wrote:

"I cannot agree to the granting of this exemption. Not only do I have serious doubts as to its legality but feel strongly that in any case it is unwise Board policy to permit current under our jurisdiction to provide free transportation for Board personnel."

altitude. During these two encounters on final approach, he had no warning from either the radar traffic control center or the CCA operators of his traffic in his vicinity.

These two incidents indicate the extent of the radar air collision problem that has now reached proportions of grave concern to both military and civil aviation. Although there is a problem in instrument flight conditions as evidenced by the collision between a TWA 4-4 and a corporate DC 3 in the clouds at Cincinnati, the most alarming frequency of occurrence is manifested by traffic coming in rapidly changing weather of mixed IFR/VFR conditions or in extremely poor visibility of what are legally VFR flight conditions.

Thus, it is encouraging to see the Civil Aeronautics Administration organizing an anti-collision symposium at its Technical Development Center at Indianapolis next Tuesday, Wednesday and Thursday aimed at bringing together all of the experts working to allocate the problem. With men of such caliber as M. G. "Doc" Head, assistant vice-president of American Airlines, "Mel" Cough, chief of NACA's Langley Laboratories Flight Test operations, and Don Stout, director of CAA's Indianapolis simulation, conducting the symposium, it should attract a significant civil and military audience. We earnestly hope it will result in an accelerated assault on this harrowing phase of the air traffic control problem by all of the aviation interests concerned.

—Robert Hiza

## Collision Clinic

"We almost tagged aircraft holes with a DC-7 over New York City the other day. He dove by head-on, near our altitude, 150 ft off our wing tip on instrument?" We were making our ILS approach at the base of a thunderstorm when we saw him flash by for about one-fourth of a second. A check with the tower revealed that he had departed VFR two minutes before we saw him. The weather was perfectly legal for a VFR departure, but it was not at all true or realistic that he got caught back out of VFR sky. So there he was changing his transcontinental rooftop DC-7 up on the ILS on instruments as we were weaving our way down on the gauges."

This description of a recent near miss between passenger loaded transports was written by United Air Lines Co-Pilot H. F. Hill, Jr., in the Air Line Pilots Association organ.

Shortly after Co-Pilot Hill's experience we heard about another encounter of a DC-3 captain who was buzzing out of an overcast at night over the outer ILS circles at LaGuardia Field, just after the DC-6 broke out of the cloud bank, another four-engine twin port whiskered by us, a head-on pass about 30 ft. higher. This pass was too brief to identify the other transport. The DC-6 pilot then saw a foreign flag line Constellation banking toward him off his left wing at the same

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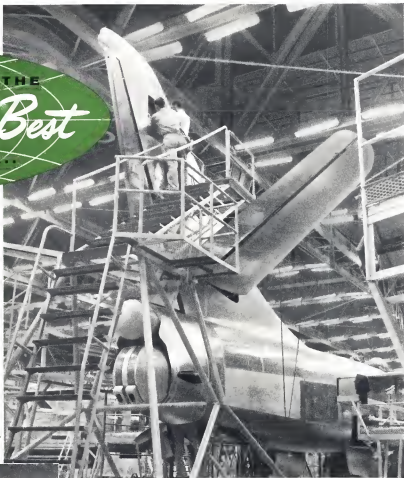
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